

NOTE: This draft dated 21 February 1997 prepared by the National Imagery and Mapping Agency (NIMA) has not been approved and is subject to modification. DO NOT USE PRIOR TO APPROVAL. (Project INST-000203)

NOT MEASUREMENT SENSITIVE

MIL-STD-2500B

TBD

EFFECTIVE 1 October 1998

SUPERSEDING

MIL-STD-2500A

12 October 1994

DEPARTMENT OF DEFENSE INTERFACE STANDARD

NATIONAL IMAGERY TRANSMISSION FORMAT VERSION 2.1

FOR THE
NATIONAL IMAGERY TRANSMISSION FORMAT STANDARD



AMSC N/A

AREA INST

FOREWORD

1. This standard is approved for use by all departments and agencies of the Department of Defense (DOD).
2. The National Imagery Transmission Format Standard (NITFS) is the suite of standards for formatting digital imagery and imagery-related products and exchanging them among members of the Intelligence Community (IC) as defined by the Executive Order 12333, the DOD, and other United States Government departments and agencies.
3. The NITFS Technical Board (NTB) developed this standard based upon currently available technical information.
4. The DOD and other IC members are committed to the interoperability of systems used for formatting, transmitting, receiving, and processing imagery and imagery-related information. This standard describes the National Imagery Transmission Format (NITF) file format and establishes its application within the NITFS.
5. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to the National Imagery and Mapping Agency, Interoperability Branch (SEII), 14675 Lee Road, Chantilly, VA 20151-1715 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

CONTENTS

<u>PARAGRAPH</u>		<u>PAGE</u>
	<u>FOREWARD</u>	ii
1.	<u>SCOPE</u>	1
1.1	Scope	1
1.2	Purpose	1
1.3	Applicability	1
1.4	Method	1
2.	<u>APPLICABLE DOCUMENTS</u>	1
2.1	General	1
2.2	Government documents	1
2.2.1	Specifications, standards, and handbooks	1
2.2.2	Other Government documents, drawings, and publications	2
2.3	Non-Government publications	32
2.4	Order of precedence	4
3.	<u>DEFINITIONS</u>	4
3.1	Acronyms used in this standard	4
3.2	Band	7
3.3	Bandwidth	7
3.4	Base Image	78
3.5	Basic Character Set (BCS)	78
3.6	Basic Character Set-Alphanumeric (BCS-A)	78
3.7	Basic Character Set-Alphanumeric (BCS-A) (non-blank)	7
3.87	Basic Character Set-Numeric (BCS-N)	78
3.98	Basic Character Set-Numeric (BCS-N) (integer)	78
3.109	Basic Multilingual Plane (BMP)	78
3.10	BCS Space	8
3.11	Block	78
3.12	Block Image	8
3.123	Blocked Image Mask	78
3.14	Brightness	8
3.15	Broadcast operation	8
3.165	Byte	89
3.176	Character	89
3.17	Common Coordinate System	9
3.18	Conditional	89
3.19	Coordinated Universal Time	89
3.20	Data	8
3.210	Data communication	89
3.21	Data segment	9
3.22	Date Time Group	89
3.23	Effectivity	8
3.24	Electronic Secondary Imagery	8
3.25	Electronic Secondary Imagery Dissemination	9
3.26	Electronic Secondary Imagery Transmission	9
3.273	Gray scale	9
3.284	Image	910
3.295	Imagery Associated Data	910
3.3026	Interface	910

CONTENTS

<u>PARAGRAPH</u>		<u>PAGE</u>
3.3127	International Telecommunication Union (ITU)	910
3.3228	Look-Up Table	910
3.3329	Military Grid Referencing System (MGRS)	910
3.340	Network	10
3.351	Non-blank	10
3.32	Open systems Interconnect Model	10
3.363	Pack Capable System	10
3.34	Pad Pixel	10
3.35	Pad Pixel Mask	11
3.376	Parity.....	101
3.387	Pixel.....	101
3.398	Primary Imagery	101
3.4039	Processed Imagery	101
3.410	Protocol.....	101
3.421	Pseudocolor	101
3.432	Red Green Blue (RGB).....	101
3.443	Required	101
3.454	Resolution	11
3.465	Sample	11
3.46	Secondary Imagery	12
3.47	Secondary Imagery Dissemination(SID)	142
3.48	Secondary Imagery Dissemination System (SIDS)	142
3.49	Space.....	142
3.50	Tile	142
3.51	Transparent Pixel	11
3.52	Transparent Pixel Mask	11
3.531	Universal Multiple Octet Coded Character Set (UCS)	142
3.572	Universal Transverse Mercator (UTM)	142
3.54	Unconstrained Field Values	11
3.55	Universal Character Set (UCS)	11
3.563	Unpack Capable System	142
3.584	Vector Quantization	142
3.59	Zulu	12
4.	<u>GENERAL REQUIREMENTS</u>	123
4.1	Background	123
4.2	NITF operations concept.....	123
4.3	Vector product information	13
4.43	NITF design objectives	134
4.54	NITF general requirements.....	134
4.65	NITF characteristics	134
4.76	Associated segments	145
4.87	Common image coordinate system	135
4.87.1	CCS structure	135
4.87.2	Row and column coordintes.....	16
4.87.3	Complexity level constraints	16

CONTENTS

<u>PARAGRAPH</u>		<u>PAGE</u>
5	<u>DETAILED REQUIREMENTS</u>	16
5.1	Format Description	16
5.1.1	Fixed fields.....	16
5.1.2	Extension fields	16
5.1.3	Supported information data types.....	16
5.1.4	Application guidance File structure requirements	17
5.1.5	Standard data type segment subheaders	17
5.1.6	Head/Subheader field specification	17
5.1.7	Field structure and default values	18
5.1.8	Field types.....	18
5.1.9	Logical recording formats	18
5.1.9.1	Bit and byte order.....	18
5.2	The NITF file header	19
5.3	NITF product and overlay concept.....	19
5.3.1	Image overlay relationships	19
5.3.2	Overlays and display level.....	20
5.3.3	Display level interpretation	20
5.3.4	Attachment level	21
5.4	Image data type	22
5.4.1	General	22
5.4.1.1	Image category (ICAT)	22
5.4.1.2	Image representation (IREP)	22
5.4.2	Image model	22
5.4.2.1	Display of NITF images	23
5.4.2.2	Blocked images	23
5.4.2.3	Blocked image masking	25
5.4.2.4	Pad pixel masking.....	26
5.4.3	NITF image information fields	27 26
5.4.3.1	Image subheader fields	27
5.4.3.2	Image data mask table	27
5.4.3.3	Image data format.....	27
5.4.3.3.1	Uncompressed image data format	27
5.4.3.3. 2 .1	Single band image uncompressed data format	27
5.4.3.3. 2 .2	Multiple band image uncompressed data format	28 27
5.4.3.3. 2 .2.1	Band sequential	28 27
5.4.3.3. 2 .2.2	Band interleaved by pixel	28
5.4.3.3. 2 .2.3	Band interleaved by block	28
5.4.3.3.2	Compressed image data format	28 27
5.4.3.4	Gray scale look-up tables (LUT)	28
5.4.3.5	Color look-up tables (LUT)	29 28
5.5	Graphic data type	29
5.5.1	Graphic subheader	29
5.5.2	Graphic data format	29
5.5.2.1	CGM graphic bounding box.....	29
5.6	Test data type	29
5.6.1	Representation of textual information	30 29
5.6.1.1	Basic Chracter Set	30 29
5.6.1.1.1	BCS A (Alphanumeric format)	30
5.6.1.1.2	BCS Basic Character Set - extended (BCS-E)	30 29

CONTENTS

<u>PARAGRAPH</u>		<u>PAGE</u>
5.6.1.23	Universal Multiple Octet Coded Character Set (UCS)	30
5.6.2	Text data subheader	30
5.7	Standard spatial support data extensions	30
5.7.1	Appropriate support data	30
5.7.2	NITF file containing georeferenced image, matrix, or raster map data	31
5.7.3	Georeferenced image, raster map, matrix, or grid data SDEs	31
5.7.4	Aliases	32
5.7.5	Generic tagged extension mechanism	32
5.7.6	Field types	33
5.87	Future expansion	33
5.87.1	Tagged record extensions	33
5.87.1.1	Registered extensions	34
5.87.1.2	Controlled extensions	35
5.87.1.3	Encapsulated extensions	35
5.87.1.3.1	Data extension segment DES structure	35
5.87.1.3.2	Use of DES	35
5.87.1.3.3	Reserved DES tags	35
5.87.2	Reserved extension segments	35
6.	<u>NOTES</u>	36
6.1	Example NITF file	36
6.1.1	Use of NITF	36
6.1.2	Example file	36
6.1.2.1	Explanation of the file header	39
6.1.2.2	Explanation of the image subheaders	40
6.1.2.2.1	Explanation of the first image subheader	42
6.1.2.2.2	Explanation of the second image subheader	44
6.1.2.3	Explanation of the graphic subheaders	45
6.1.2.3.1	Explanation of the first graphic subheader	46
6.1.2.3.2	Explanation of the second graphic subheader	47
6.1.2.3.3	Explanation of the third graphic subheader	48
6.1.2.3.4	Explanation of the fourth graphic subheader	53
6.1.2.3.45	Explanation of the fifth graphic subheader	50
6.1.2.4	Explanation of the text subheaders	51
6.1.2.4.1	Explanation of the first text subheader	51
6.2	Product considerations	51
6.2.1	NITF product configurations	52
6.2.1.1	General	52
6.2.1.1.1	Single file, single base image	52
6.2.1.1.2	Single file, multiple images	52
6.2.1.1.3	Single file, no image	52
6.2.1.1.4	Multiple correlated files	52
6.2.1.2	Single file, single base image	52
6.2.1.2.1	Image segment overlays	53
6.2.1.2.2	Graphic segment overlays	53
6.2.1.2.3	Non-destructive overlays	53
6.2.1.2.4	Text segments	53
6.2.1.2.5	Extension data	53
6.2.1.3	Single file, multiple images	54

CONTENTS

<u>PARAGRAPH</u>		<u>PAGE</u>
6.2.1.3.1	Overlays	564
6.2.1.3.2	Text segments	564
6.2.1.3.3	Extension data	564
6.2.1.4	Single file, no image	564
6.2.1.5	Multiple correlated files	564
6.2.1.5.1	Stereo imagery	564
6.2.1.5.2	Imagery mosaics	564
6.2.1.5.3	Reduced resolution data sets (Rsets)	564
6.2.1.5.4	Imagery and maps	564
6.3	Sample NITF file structure	564
6.4	Subject term (key word) listing	586
6.5	Changes from previous issue	586

FIGURE

1.	NITF operational concept	123
2.	NITF functional architecture	134
3.	Header-file/subheader-subfile structure	145
4.	CCS structure Common coordinate system example	156
5.	NITF file structure	17
6.	NITF file header structure	19
7.	NITF display level illustration	21
8.	Attachment level relationship	22
9.	Image coordinate system	23
10.	A blocked image	24
11.	A blocked, padded image	25
12.	A blocked, padded image with empty blocks	26
13.	Tagged record and data extension segment formats	34
14.	Data extension segment format	35
145.	Sample file composite image	376
156.	Single file, single base image	531
167.	Single file, multiple images	553
C-1	Example of a location grid	107
C-2	Alternatives for defining mixed positional accuracy areas	109

TABLE

I.	Categories of Image/Matrix/Grid Data	31
II.	Controlled tagged record extension format	33
III.	Example NITF file header	37
IVII.	Example image subheader of the base image	4039
VIII.	Example image subheader of the first inset image	432
VIIV.	Graphic subheader for the first graphic	454
VIIIV.	Graphic subheader for the second graphic	465
VIIIIV.	Graphic subheader for the third graphic	476
IXVII.	Graphic subheader for the fourth graphic	487
XVIII.	Graphic subheader for the fifth graphic	5048
XIX.	Text subheader for the text document	5150
XIX.	Sample NITF file structure	575
A-1.	NITF file header	597
A-2.	NITF image item category and representation	664

CONTENTS

<u>TABLE</u>		<u>PAGE</u>
A-3.	NITF image subheader	675
A-3(A).	NITF image data mask subheader	807 8
A-4.	Security control markings	820
A-5.	NITF graphic subheader	831
A-6.	NITF text subheader	875
A-7.	Registered tagged record extension format	908 8
A-8.	NITF data extension segment subheader	918 8
A-9.	NITF reserved extension segment subheader	930
B-1.	Basic Latin character set	974
B-2.	Latin supplement character set	985
B-3.	Basic latin character set explanation	996
B-4.	latin supplement character set explanation	101 98
C-1.	GEOPS Geo positioning information extension	109
C-2.	GRDPS Grid reference data extensions	110
C-3.	GEOLO local geographic coordinate systems extension	111
C-4.	MAPLO local cartographic coordinate system extension	112
C-5.	RECPT Registration point extension	112
C-6.	ACCPO Positional accuracy extension	113
C-7.	ACCCHZ Horizontal extension	114
C-8.	ACCVT Bertical accuracy extension	115
D-1.	SOURCE Source extension	118
E-1.	SNSPS Sensor parameters extension	122
F-1.	RPFDES data extension	125
F-2.	RPF attributes and their parameters	
	that can be called by the attribute extension	125
F-3.	Explicit areal extent part of RPFDES data extension	126
 <u>APPENDIX</u>		
A.	NITF Tables	597
B.	Implementation Considerations	941
C.	Spatial Data Extensions	104
D.	Map Source Data Extension	117
E.	Sensor Parameters Data Extension	122
F.	Raster Product Format (RPF) Data Extensions	124

1. SCOPE

1.1 Scope. This standard establishes the requirements for the file format component of the National Imagery Transmission Format Standard (NITFS). The file format described in this document is called the National Imagery Transmission Format (NITF). The NITFS is a collection of related standards and specifications developed to provide a foundation for interoperability in the dissemination of imagery and imagery associated data among different computer systems. An overview of the component documents of the NITFS can be found in MIL-HDBK-1300.

1.2 Purpose. NITF Version 2.1 changes NITF Version 2.0 by deleting a number of capabilities in NITF Version 2.0 that resulted from the requirement to be compatible with the original NITF Version 1.1. NITF Version 2.1 deletes the requirements for (1) extension of Adaptive Recursive Interpolated Differential Pulse Code Modulation (ARIDPCM) including 11-bit pixels and synchronization codes, (2) bit mapped symbol processing, (3) object symbol processing, and (4) label processing. For this document, NITF refers to NITF Version 2.1.

1.3 Applicability. This standard is applicable to the Intelligence Community (IC) and the Department of Defense (DOD). It is mandatory for all Secondary Imagery Dissemination Systems (SIDS) in accordance with the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD(C³I)) memorandum, Subject: National Imagery Transmission Format Standard (NITFS), 12 August 1991. MIL-STD-2500 shall be implemented in accordance with JIEO Circular 9008, and MIL-HDBK-1300. New equipment and systems, those undergoing major modification, or those capable of rehabilitation, shall conform to this standard.

1.4 Method. This standard provides a detailed description of the overall structure of the file format, as well as specification of the valid data content and format for all fields defined within a NITF file. Several NITF implementation issues are addressed in the appendices. Issues pertinent to the use of NITF as the file format for imagery transmission are described in the NITFS transmission protocol component, MIL-STD-2045-44500. An example of NITF as the basis for file formation in tactical communications is provided in section 6. Certifiable implementation of the NITF for support of interoperability is subject to constraints not specified in this standard. Pertinent compliance requirements are defined in JIEO Circular 9008.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, and 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4, and 5 of this standard, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issue of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

FEDERAL STANDARDS

FED-STD-1037B - Telecommunications: Glossary of Telecommunication Terms.

FEDERAL INFORMATION PROCESSING STANDARDS

FIPS PUB 10-3 - Countries, Dependencies, Areas of Special Sovereignty, and Their Principal Administrative Divisions.

MIL-STD-2500B

FIPS PUB 128 - Computer Graphics Metafile (CGM) [adaptation of American National Standards Institute (ANSI) X3.122-1986.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-188-196 - Bi-Level Image Compression for the National Imagery Transmission Format Standard

MIL-STD-188-198 - Joint Photographic Experts Group (JPEG) Image Compression for the National Imagery Transmission Format Standard

MIL-STD-188-199 - Vector Quantization Decompression for the National Imagery Transmission Format Standard

MIL-STD-2045-44500 - Tactical Communications Protocol 2 (TACO2) for the National Imagery Transmission Format Standard

MIL-STD-2301 - Computer Graphics Metafile (CGM) for the National Imagery Transmission Format Standard

MIL-STD-6040 - United States Message Text Format

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-1300 - National Imagery Transmission Format Standard (NITFS)

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

(Copies of Federal Information Processing Standards (FIPS) are available to Department of Defense activities from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094. Others must request copies of FIPS from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-2171.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DEFENSE INFORMATION SYSTEMS AGENCY PUBLICATION

JIEO Circular 9008 - NITFS Certification Test and Evaluation Program Plan

(Requests for copies should be addressed to the Joint Interoperability Test Command, NITFS Lab, Building 57305, Fort Huachuca, AZ 85613-7020.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODIIS cited in the solicitation. Unless otherwise specified, the issues or documents not listed in the DODISS are the issues or the documents cited in the solicitation.

~~CONSULTATIVE COMMITTEE OF INTERNATIONAL RADIO-~~
INTERNATIONAL TELECOMMUNICATION UNION

ITU-R	-	Encoding Parameters of Digital Television for Studios-Section 11F-
Recommendation 601-2		Digital Methods of Transmitting Television Information
CCIR ITU-BT	-	Encoding Parameters of Digital Television for Studios
Recommendation 601- 4 5		

~~CONSULTATIVE COMMITTEE OF INTERNATIONAL TELEGRAPH AND TELEPHONE-~~

CCITT ITU-T T.4 (1993.03)	-	Standardization of Group 3 Facsimile Apparatus for Document
Recommendation T.4 AMD2 08/95		Transmission

INTERNATIONAL ORGANIZATION FOR STANDARDS

ISO/OSI IEC 7498-1	-	Information technology; Open Systems Interconnection; Basic reference model, Part 1: The basic model; 1994-11-00
ISO 8601-1988(E)	-	Data Element and Exchange Formats Information Exchange; Representation of Dates and Times; June 1988
ISO 8879	-	Information Processing - Text and Office Systems - Standard Generalised Mark-up Language (SGML), 1986
ISO/IEC 9069	-	SGML Document Interchange Format, 1988
ISO 10646, Part 1	-	Information Technology - Universal Multiple - Octet Coded Character Set (UCS), Architecture and Basic Multilingual Plan
ISO/IEC 10918-1	-	Information Technology: Digital Compression and Coding of Continuous-Tone Still Images; Part 1: Requirements and Guidelines; February 1994
ISO/IEC 10918-3	-	Information Technology; Digital Compression and Coding of Continuous-Tone Still Images; Part 3: Extensions
ISO/IEC 10918-4	-	Information Technology; Digital compression and Coding of Continuous-Tone Still Images; Part 4: Registration Procedures for JPEG Profile, APPn Marker, and SPIFF Profile ID Marker
ISO 11172-2	-	Information Technology - Coding of Moving Pictures and Associated Audio for Digital Storage Media at up to about 1,5 Mbit/s; Part 2: Video
ISO 12087-5	-	Information Technology; Computer Graphics and Image Processing and Interchange; Part 5: Basic Imagery Interchange Format; mm, 199x

ISO/IEC 86321 1992 AMD 2	-	Information Technology; Computer Graphics ; Metafile for Storage and Transfer of Picture Description ; Ammendment 2: Application Structuring Extensions; July 1995
ITU-T H.262 ISO/IEC 13818-1	-	Information Technology; Generic Coding of Moving Pictures and Associated Audio Information ; Part 1: Systems
ITU-T H.262 ISO/IEC 13818-2	-	Information Technology; Generic Coding of Moving Pictures and Associated Audio Information; Part 2: Video
ITU-T H.262 ISO/IEC 13818-3	-	Information Technology; Generic Coding of Moving Pictures and Associated Audio Information; Part 3: Audio

(Applications for copies should be addressed to the American National Standards Institute, 13th Floor, 11 West 42nd Street, New York, NY 10036.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 Acronyms used in this standard. The acronyms used in this standard are defined as follows:

- a. AL - Attachment Level
- b. **API** - **Application Program Interface**
- c. ASD(C³I) - Assistant Secretary of Defense for Command, Control, Communications, and Intelligence
- d. ASCII - American Standard Code for Information Interchange
- e. BCS - Basic Character Set
- f. BCS-A - Basic Character Set - Alphanumeric ~~Format~~
- g. **BCS-E** - **Basic Character Set - Extended**
- h. BCS-N - Basic Character Set - Numeric ~~Format~~
- i. **BE** - **Basic Encyclopedia**
- j. BIIF - Basic Imagery Interchange Format. **See ISO 12087-5.**
- k. BMP - Basic Multilingual Plane
- l. C - Conditional
- m. CAT **Scan** - ~~Scan~~Computerized Axial Tomography Scan

- ~~m. CCIR — International Radio Consultative Committee~~
- ~~l. CCITT — International Telegraph and Telephone Consultative Committee (Organized under the auspices of International Telecommunications Union (ITU))~~
- n. **CCS** - **Common Coordinate System**
- o. CE - Controlled Extension
- p. CETAG - Controlled Tagged Record Extension
- ~~o. CFS — Center for Standards~~
- q. CGM - Computer Graphics Metafile
- r. COTS - Commercial Off The Shelf
- s. CRT - Cathode Ray Tube
- t. C³I - Command, Control, Communications, and Intelligence
- u. DES - Data Extension Segments
- v. DGIWG - Digital Geographic Information Working Group
- w. DIGEST - Digital Geographic information Exchange Standard
- ~~v. DISA — Defense Information Systems Agency~~
- x. DL - Display Level
- y. DOD - Department of Defense
- ~~y. DPCM — Differential Pulse Code Modulation~~
- z. DTG - Date-Time-Group
- aa. DTM - Digital Terrain Model
- ab. EEI - **(1) External Environment Interface**
(2) Essential Elements of Information
- ac. FIPS - Federal Information Processing Standard
- ad. IC - (1) Intelligence Community
(2) Image Compression
- ae. IEEE - Institute of Electrical and Electronic Engineers Portable
POSIX Interface Operating System
- af. **IREP** - **Image REPresentation**

ag.	ISO	-	International Organization for Standards
ah.	ITU	-	International Telecommunication Union
ai.	JIEO	-	Joint Interoperability and Engineering Organization
aj.	JITC	-	Joint Interoperability Test Command
ak.	JPEG	-	Joint Photographic Experts Group
al.	LSB	-	Least Significant Bit
am.	LUT	-	Look-Up Table
an.	MGRS	-	Military Grid Referencing System
ao.	MPEG	-	Motion Picture Experts Group
an.	MOA	—	Memoranda of Agreement
ap.	MSB	-	Most Significant Bit
aq.	MTF	-	Message Text Format
ar.	NITF	-	National Imagery Transmission Format
as.	NITFS	-	National Imagery Transmission Format Standard
as.	NOSE	—	NATO Open systems Environment
at.	NPPBH	-	Number of Pixels Per Block Horizontal
au.	NPPBV	-	Number of Pixels Per Block Vertical
au.	NSIF	—	NATO Secondary Imagery Format
av.	NSIFS	—	NATO Secondary Imagery Format Standard
av.	NTB	-	National Imagery Transmission Format Standard Technical Board
ax.	OADR	—	Originating Agency's Determination is Required
aw.	OSE	-	Open System Environment
ax.	OSI	-	Open Systems Interconnect model
ay.	R	-	Required
az.	RES	-	Reserved Extension Segment
ba.	RGB	-	Components from video standardization: R for Red, G for Green, B for Blue

bb. SBND	-	Graphic Bound
bc. SDE	-	Support Data Extension
bd. SDIF	-	SGML Document Interface Format
be. SGML	-	Standardized Graphic Mark-up Language
bd. SID	—	Secondary Imagery Dissemination
bf. SIDS	-	Secondary Imagery Dissemination System
bg. SLOC	-	Graphic Location
bh. TBD	-	To Be Determined
bi. TACO2	-	Tactical Communications Protocol 2
bg. TAFIM	—	Technical Architecture Framework for Information Management
bj. UCS	-	Universal Multiple Octet Coded Character Set
bk. UDHD	-	User Defined Header Data
bl. UDID	-	User Defined Image Data
bm. UN	-	United Nations
bn. USMTF	-	United States Message Text Format
bo. UTC	-	Coordinated Universal Time
bp. UTM	-	Universal Transverse Mercator
bq. VQ	-	Vector Quantization
br. YCbCr 601	-	Y = Brightness of signal, Cb = Chrominance (blue), Cr = Chrominance (red) (CCIR 601) (ITU-BT 601-5)

3.2 Band. ~~For the purpose of NITF, one of the two dimensional (row/column) pixel value arrays that comprise an image. In the case of a grayscale, bit level, or 8 bit color image, the representation is a single two dimensional array; in the case of a 24 bit true color image (8 bits for each of three color elements), the representation is three two dimensional arrays. (Synonymous with tile).~~ **A well defined range of wavelengths, frequencies or energies of optical, electric, or acoustic radiation. At the pixel level, a band is represented as one of the vector values of the pixel. For example, a pixel consisting of three band values is a 3-vector pixel.**

3.3 Bandwidth. 1. The difference between the limiting frequencies within which performance of a device, in respect to some characteristic, falls within specified limits. 2. The difference between the limiting frequencies of a continuous frequency band.

3.4 Base Image. ~~For the purpose of MIL-STD-2500, t~~ The base image is the principle image of interest or focus for which other data may be inset or overlaid ~~laid~~. The NITF file can have none, one, or multiple base images.

3.5 Basic Character Set (BCS). A subset of the Basic Multilingual Plane (BMP). The Basic Character Set consists of the characters defined in the first row (row 0x00) of the ~~P~~BMP A-zone. For this reason the first octet normally used to define character positions in the BMP will be omitted when expressing BCS character codes. Valid BCS character codes, therefore, shall range from 0x00 through 0xFF.

3.6 Basic Character Set-Alphanumeric (BCS-A). A subset of the Basic Character Set. The range of allowable characters consists of space through tilde, codes 0x20 through 0x7E, **0x0A, 0x0C, and 0x0D**.

~~3.7 Basic Character Set-Alphanumeric (BCS-A) (non blank). A subset of the Basic Character Set. The range of allowable characters consists of exclamation point through tilde, codes 0x21 through 0x7E.~~

3.7 Basic Character Set-Numeric (BCS-N). A subset of the Basic Character Set-Alphanumeric. The range of allowable characters consists of minus through **the number "9"**, BCS codes 0x2D through 0x39, and plus, code 0x2B.

3.8 Basic Character Set-Numeric (BCS-N) (integer). A subset of the Basic Character Set-Numeric. The range of allowable characters consists of number s "0" through **the number "9,"** BCS codes 0x30 through 0x39.

3.9 Basic Multilingual Plane (BMP). The BMP is the first plane of the first group of the Universal Multiple-Octet Coded Character Set as defined by ISO/IEC 10646-1. The BMP is a matrix consisting of 256 rows each containing 256 cells. Individual cells are indexed using a pair of octets expressed in hexadecimal format. The first octet indicates the row containing the cell and the second octet indicates the position of the cell in the specified row. Rows within the BMP are grouped into four zones: A-zone (rows 0x00 through 0x4D), I-zone (rows 0x4E through 0x9F), O-zone (rows 0xA0 through 0xDF), and R-zone (rows 0xE0 through 0xFF). The A-zone is used for alphabetic and syllabic scripts together with various symbols. The I-zone is used for unified East Asian ideographs. The O-zone is reserved for future standardization. The R-zone is restricted for graphic characters that are used in ways not explicitly constrained by ISO/IEC 10646-1.

3.10 **BCS Space. BCS code 0x20.**

3.11 Block. ~~For the purpose of MIL-STD-2500, a~~ A block is a rectangular array of pixels. ~~An image consists of the union of one or more non-overlapping blocks.~~ (Synonymous with tile.)

3.12 **Block Image. A blocked image is comprised of the union of one or more non-overlapping blocks. (Synonymous with tiled image.)**

3.13 Blocked Image Mask. A structure which identifies the blocks in a blocked (tiled) image which contain no valid data, and which are not included in the file. The structure allows the receiver to recognize the offset for each recorded/transmitted block. For example, a 2x2 blocked image file which contained no valid data in the second block (block 1) would be recorded in the order: block 0, block 2, block 3. The blocked image mask would identify block 1 as a non-existing block, and would allow the receiving application to construct the image in the correct order.

~~3.13 Briefing board. A briefing aid that includes an exploited, annotated hardcopy image and other textual and/or graphical material that presents significant intelligence information.~~

3.14 Brightness. An attribute of visual perception, in accordance with which a source appears to emit more or less light. ~~For the purpose of NITFS, a~~ A pixel with a ~~larger~~ **higher** value is brighter than a pixel with a lower value.

~~3.15 Broadcast operation. The transmission of information so that it may be simultaneously received by stations that usually make no acknowledgement.~~

3.15 Byte. A sequence of ~~N~~ **8** adjacent binary digits. ~~, usually treated as a unit, where N is a non-zero integral number. For the purpose of this standard, a byte is defined as an eight-bit octet.~~

3.16 Character. 1. A letter, digit, or other ~~symbol~~ **graphic** that is used as part of the organization, control, or representation of data. 2. One of the units of an alphabet. ~~Note: For MIL-STD-2301, a character is an unsigned integer between and including 32 and 126 and is specified in this document using the character array C1, C2, ..., Cn.~~

3.17 **Common Coordinate System. The virtual two dimensional Cartesian-like coordinate space which shall be common for determining the placement and orientation of displayable data.**

3.18 Conditional. ~~In the context of this standard, a data field type~~ **A state applied to a NITF header or subheader data field** whose existence **and content** depends **is dependent** on the value used in a previous **existence and/or content of another** field.

3.19 Coordinated Universal Time. The time scale maintained by the Bureau International de l'Heure (International Time Bureau) that forms the basis of a coordinated dissemination of standard frequencies and time signals.

~~3.20 Data. Representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means. Any representations such as characters or analog quantities to which meaning is or might be assigned.~~

3.20 Data communication. The transfer of information between functional units by means of data transmission according to a protocol.

3.21 **Data segment. A subheader and associated data.**

3.22 Date Time Group. A composite representation of date and time.

~~3.23 Effectivity. Some of the capabilities specified in this document are not required as of the issue date of the document. All such capabilities are marked with effectivity numbers, (for example, Effectivity 1). Each effectivity number will be replaced by a specific date in subsequent releases of this document.~~

~~3.24 Electronic Secondary Imagery. Softcopy secondary imagery which is capable of being stored or transmitted via electronic means. Electronic secondary imagery may contain imagery derived products and associated information as attachments and/or overlays to the main image which can be manipulated by computer hardware and software.~~

~~3.25 Electronic Secondary Imagery Dissemination. The process of dispersing or distributing electronic secondary imagery using electronic secondary imagery transmission to designated addressees.~~

~~3.26 Electronic Secondary Imagery Transmission. The process of moving an electronic secondary imagery file from one place to another via an electronic medium over a network, (for example, the mail system or a wide area network), over a time interval ranging from greater than real time to a period of several days, at a level of quality determined by receiver requirements.~~

3.23 Grayscale. An optical pattern consisting of discrete steps or shades of gray between black and white.

3.24 Image. ~~A representation of physical visualization, for example, a picture. For the purposes of MIL-STD-2500, an image is the computer (digital) representation of a picture. An image is comprised of discrete picture elements called pixels structured in an orderly fashion consisting of pixel value arrays formatted using bands and blocks.~~ **A two-dimensional rectangular array of pixels indexed by row and column.**

3.25 Imagery Associated Data. ~~1. Data which is needed to properly interpret and render pixels; —2. Data which is used to annotate imagery such as text, graphics, etc.; —3. Data which describes the imagery such as textual reports; and data which support the exploitation of imagery.~~

3.26 Interface. 1. A concept involving the definition of the interconnection between two equipment items or systems. The definition includes the type, quantity, and function of the interconnecting circuits and the type, form, and content of signals to be interchanged via those circuits. Mechanical details of plugs, sockets, and pin numbers, etc., can be included within the context of the definition. 2. A shared boundary, e.g., the boundary between two subsystems or two devices. 3. A boundary or point common to two or more similar or dissimilar command and control systems, subsystems, or other entities against which or at which necessary information flow takes place. 4. A boundary or point common to two or more systems or other entities across which useful information flow takes place. (It is implied that useful information flow requires the definition of the interconnection of the systems which enables them to interoperate.) 5. The process of interrelating two or more dissimilar circuits or systems. 6. The point of interconnection between user terminal equipment and commercial communication-service facilities.

3.27 International Telecommunication Union (ITU). A civil international organization established to promote standardized telecommunication on a worldwide basis. ~~Note: The CCIR and CCITT are committees under the ITU. The ITU headquarters is located in Geneva, Switzerland.~~ While older than the United Nations (UN), it is recognized by the UN as the specialized agency for telecommunications.

3.28 Look-Up Table. ~~A table where each data value of a pixel corresponds to an entry in the table.~~ **A collection of values used for translating image samples from one value to another. The current sample value is used as an index into the look-up table(s); therefore, the number of entries in each look-up table for a binary image would contain two entries, and each look-up table for an 8-bit image would contain 256 entries. Multiple look-up tables allow for the translation of a 1-vector pixel value to an n-vector pixel value.**

3.29 Military Grid Referencing System (MGRS). A means of expressing UTM coordinates as a character string, with the 100-kilometer components replaced by special letters (which depend on the UTM zone and ellipsoid). ~~MIL-STD-2500 uses 10-figure Military Grid References which have 15 characters in all, for example—13MCS1234512345.~~

3.30 Network. 1. An interconnection of three or more communicating entities and (usually) one or more nodes. 2. A combination of passive or active electronic components that serves a given purpose.

3.31 Non-blank. ~~For the purposes of MIL-STD-2500, non blank indicates that the character space (BCS code 0x20) shall not be used for all entries in the field.~~ **Non-blank indicates that the field cannot be filled by the character space BCS code 0x20 but may contain the character space when included with other characters. (embedded blanks)**

3.32 Open Systems Interconnect model. **This model is defined in ISO standard 7498-1.**

3.33 Pack Capable System. A system which is capable of generating a NITF file.

3.34 Pad Pixel. **A pixel with sample values that have no significant meaning to the image. Pad pixels are used with block images when either the number of pixel rows in an image is not an integer multiple of the desired number of vertical image blocks, or when the number of pixel columns in an image is not an integer multiple of the desired number of horizontal image blocks. In all cases, the sample values**

for pad pixels shall not appear within the bounds of significant sample values for pixels which comprise the original image.

3.35 Pad Pixel Mask. A data structure which identifies recorded/transmitted image blocks which contain pad pixels. The pad pixel mask allows applications to identify image blocks which require special interpretation due to pad pixel content.

3.36 Parity. In binary-coded systems, the oddness or evenness of the number of ones in a finite binary stream. ~~This~~ **It** is often used as a simple error-detection check and will detect (but not correct) the occurrences of any single bit error in the field. ~~Note: By the addition of one extra bit, a bit stream can be forced to a specified parity state.~~

3.37 Pixel. ~~For the purposes of MIL-STD-2500, pixel is defined as: (1) The atomic element of an image having a discrete value. Although a pixel value represents a minute area of an image, the generic use of the term does not specify the exact shape or symmetry of the area (circle, oval, square, rectangle, other) represented by the value. In MIL-STD-2500, the shape of the area represented by a specific pixel value is either defined implicitly by the specification of the production source of the data, or explicitly through the use of NITF extension data. (2) An acronym for a Picture Element (also referred to as PEL). When raw image data is displayed on a monitor, it may be represented by many tiny dots, those dots are commonly referred to as pixels. In the case of a monochrome monitor, each dot may be a pixel; in the case of a color monitor, 3 dots (red, green, and blue elements) may represent a pixel, with the color of the pixel depending on which dots are illuminated, and how brightly. Depending upon the chosen zoom or magnification of an image, multiple sets of dots (display pixels) may be needed to portray a single pixel value (definition 1).~~ **A pixel is represented by an n-vector of sample values, where n corresponds to the number of bands comprising the image.**

3.38 Primary Imagery. Unexploited, original imagery data that has been derived directly from a sensor. Elementary processing may have been applied at the sensor, and the data stream may include auxiliary data.

3.39 Processed Imagery. Imagery that has been formatted into image pixel format, enhanced to remove detected anomalies, and converted to a format appropriate for subsequent disposition.

3.40 Protocol. 1. [In general], A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. For example, a data link protocol is the specification of methods whereby data communication over a data link is performed in terms of the particular transmission mode, control procedures, and recovery procedures. 2. In layered communication system architecture, a formal set of procedures that are adopted to facilitate functional interoperation within the layered hierarchy. ~~Note: Protocols may govern portions of a network, types of service, or administrative procedures.~~

3.41 Pseudocolor. A user-defined mapping of N bits into arbitrary colors.

3.42 Red Green Blue (RGB). Components from video standardization.

3.43 Required. ~~In the context of MIL-STD-2500, a data field that must be present and filled with valid data or the designated default.~~ **A NITF header or subheader field that must be present and filled with valid data.**

3.44 Resolution. 1. The minimum difference between two discrete values that can be distinguished by a measuring device. ~~Note: High resolution does not necessarily imply high accuracy.~~ 2. The degree of precision to which a quantity can be measured or determined. 3. A measurement of the smallest detail that can be distinguished by a sensor system under specific conditions. **Note: High resolution does not necessarily imply high accuracy.**

3.45 Sample. ~~For the purpose of MIL-STD-2500, one element in the two-dimensional (column) arrays that comprises a band (component) of the image (synonymous with pixel (definition 1 of pixel above)). In MIL-STD-2500, a sample (pixel) is indexed according to the row and column of the array where it appears. Historically, the~~

~~row and column indicie is sometimes referred to as line (row) and sample (column).~~ **The atomic element of an image pixel having a discrete value. One sample from the same location in each band comprising an image will combine to form a pixel.**

3.46 **Secondary Imagery.** **Secondary Imagery is digital imagery and/or digital imagery products derived from primary imagery or from the further processing of secondary imagery.**

3.47 Secondary Imagery Dissemination (SID). ~~The process of post-collection electronic dissemination of Command, Control, Communications, and Intelligence (C³I) digital imagery and associated data, over a time interval ranging from near real-time to a period of days, at a level of quality determined by receiver requirements.~~ **The process of dispersing or distributing digital secondary imagery.**

3.48 Secondary Imagery Dissemination System (SIDS). ~~The equipment and procedures used in the electronic transmission and receipt of exploited non-original quality imagery and imagery products in other than real- or near-real-time~~ **secondary imagery dissemination.**

3.49 Space. BCS character hexadecimal x 20 (0x20).

3.50 Tile. ~~(See block.)~~ Synonymous with Block

3.51 Transparent Pixel. ~~A fill pixel within an image block. Transparent pixels are included to ensure that each block is filled with contiguous pixel values, but should be interpreted as having no meaning.~~

3.52 Transparent Pixel Mask. ~~A data structure which identifies image blocks which contain transparent pixels. The transparent pixel mask allows the application to easily identify blocks which require special interpretation due to transparent pixel content.~~

3.51 Universal Multiple Octet Coded Character Set (UCS). **The Universal Multiple Octet Coded Character Set is** ~~Used for expressing text that must be human readable, potentially in any language of the world. This character set is selected from~~ **It is defined in ISO 10646.**

3.52 Universal Transverse Mercator. A system of grids for global use between latitudes 84 degrees North and 80 degrees South. The range of longitudes 180 degrees West to 180 degrees East is divided into 60 zones, each of which is a grid based on the Transverse Mercator projection. The actual grid depends on the choice of geodetic datum as well as the zone.

3.54 Unconstrained Field Values. ~~A field with a fixed length and values that are open. The values are only constrained by the concept of operations.~~

3.55 Universal Character Set (UCS). ~~The UCS is used for expressing text that must be human readable, potentially in any language of the world. This character set is selected from ISO 10646.~~

3.53 Unpack Capable System. A system which is capable of receiveing/processing a NITF file.

3.54 Vector Quantization. A compression technique in which many groups of pixels in an image are replaced by a smaller number of image codes. A clustering technique is used to develop a codebook of "best fit" pixel groups to be represented by the codes. Compression is achieved because the image codes can be recorded using fewer bits than the original groups of pixels they represent.

3.50 Zulu. ~~Coordinated Universal Time (UTC). Formerly a synonym for Greenwich Mean Time. The date time groups identified within this standard assume the time to be in UTC (Zulu).~~

4. GENERAL REQUIREMENTS

4.1 Background. The DOD and the IC use multiple types of systems for the reception, transmission, storage, and processing of images, graphics, text, and associated data. Without special efforts, the file format used in systems of one service or agency are likely to be incompatible with the format of another system. Since each system may use a unique, internal data representation, a common format for exchange of information across systems is needed for interoperability of systems within and among DOD and IC organizations. As the need for imagery-related systems grows, their diversity is anticipated to increase. The need to exchange data is also anticipated to increase, even though systems of each organization must retain their own individual characteristics and capabilities. This document defines the NITF, the standard file format for imagery and imagery-related products to be used by the DOD and IC. The NITF provides a common basis for storage and interchange of images and associated data among existing and future systems. The NITF can be used to support interoperability by simultaneously providing a data format for shared access applications, while also serving as a standard file format for dissemination of images and associated data (text, graphics).

4.2. NITF operations concept. The NITF will be used for transmission and storage of electronic imagery within and among DOD and IC organizations. The NITF has direct application to the dissemination of imagery to requesters of imagery derived intelligence. Multimedia intelligence reports will be composed and packaged into a single file which answer the Essential Elements of Information (EEIs) of a particular requester. The intelligence reports may be composed of textual reports along with images, annotated images, graphics, and maps. Intelligence reports are generated after an interpreter exploits primary images or further exploits a secondary image pulled out of an archive. The NITF is suitable for archiving imagery required to support the collection process in the reconnaissance cycle. Figure 1 illustrates the formats used in the exploitation process of the reconnaissance cycle.

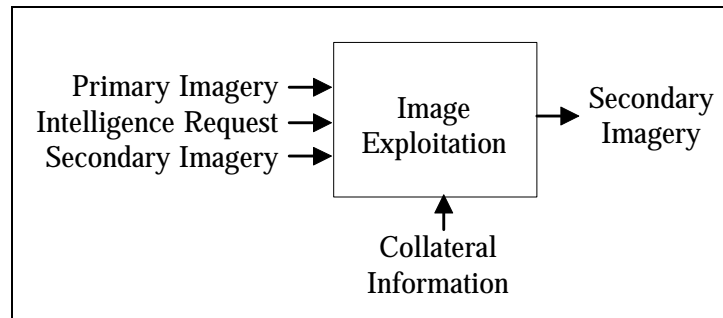
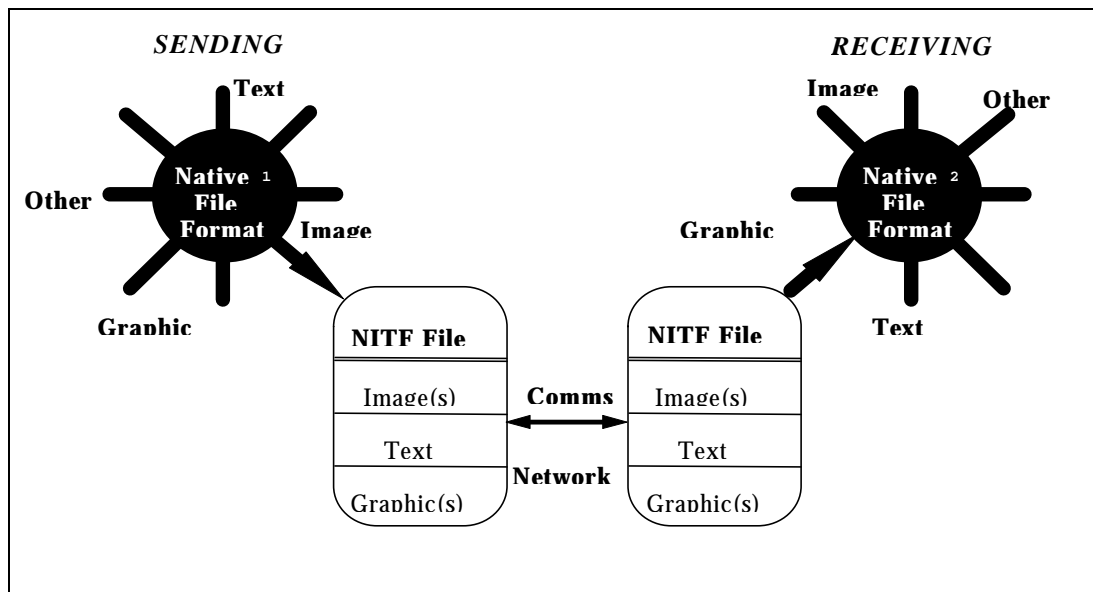


FIGURE 1. NITF operational concept.

In the NITF concept, data interchange between systems is enabled by a potential cross-translation process. When systems use other than NITF as an internal imagery format, each system will have to translate between the system's internal representation for files and data, and the NITF file format. A system from which data is to be transferred is envisioned to have a translation module that accepts information, structured according to the system's internal representation for images, annotations, text files, and other data, and assembles this information into one file in the standard NITF file format. Then the file will be exchanged with one or more recipients. The receiving systems will reformat the file, converting it into one or more files structured as required by the internal representation of the receiving station. The functional architecture of this cross-translation process is shown on figure 2. In the diagram, the terms "Native₁ File Format" and "Native₂ File Format" refer to files represented in a way potentially unique to the sending (system-1) or receiving (system-2) system. Using the NITF, each system must be compliant with only one external file format that will be used for interchange with all other participating systems. The standard format allows a system to send data to several other systems since each receiving system converts the file into its own native file format. Each receiving system can translate selectively and permanently store only those portions of data in the received file that are of interest. This allows a system to transmit all of its data in one file, even though some of the receiving systems may be unable to process certain elements of the data usefully. NITF can also serve as the internal native file format so any translation would be eliminated.

FIGURE 2. NITF functional architecture.4.3 Vector product information. TBD.4.43 NITF design objectives. The design objectives of the NITF are as follows:

- a. To provide a means whereby diverse systems can share imagery and associated data.
- b. To allow a system to send comprehensive information within one file to users with diverse needs or capabilities, allowing each user to select only those data items that correspond to their needs and capabilities.
- c. To minimize the cost and schedule required to achieve such capability.

4.54 NITF general requirements. The NITF is specified to satisfy several general requirements in response to the role it plays in the NITF functional architecture. These requirements are:

- a. To be comprehensive in the kinds of data permitted in the file within the image-related objectives of the format, including geolocated imagery or image related products . ~~in compliance with relevant standards.~~
- b. To be implementable across a wide range of computer systems without reduction of available features.
- c. To provide extensibility to accommodate data types and functional requirements not foreseen.
- d. To provide useful capability with limited data formatting overhead.

4.65. NITF characteristics. To serve a varied group of users exchanging multiple types of imagery and imagery-related data who are using differing hardware and software systems, the NITF strives to possess the following characteristics:

- a. Completeness - allows exchange of all needed imagery and imagery-related data.
- b. Simplicity - requires minimal preprocessing and postprocessing of transmitted data.
- c. Minimal overhead - minimized formatting overhead, particularly for those users transmitting only a small amount of data and for bandwidth-limited users.
- d. Universality - provides universal features and functions without requiring commonality of hardware or software.

4.76 Associated segments. Associated files shall be grouped in a package by subheader-~~subfile~~ **data** structure within a ~~header~~-file, as shown in figure 3.

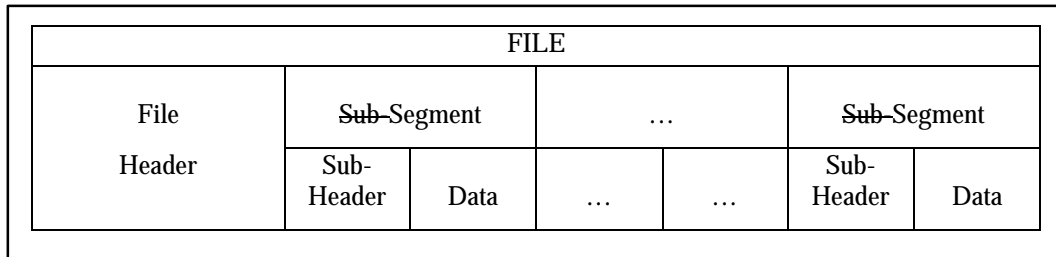
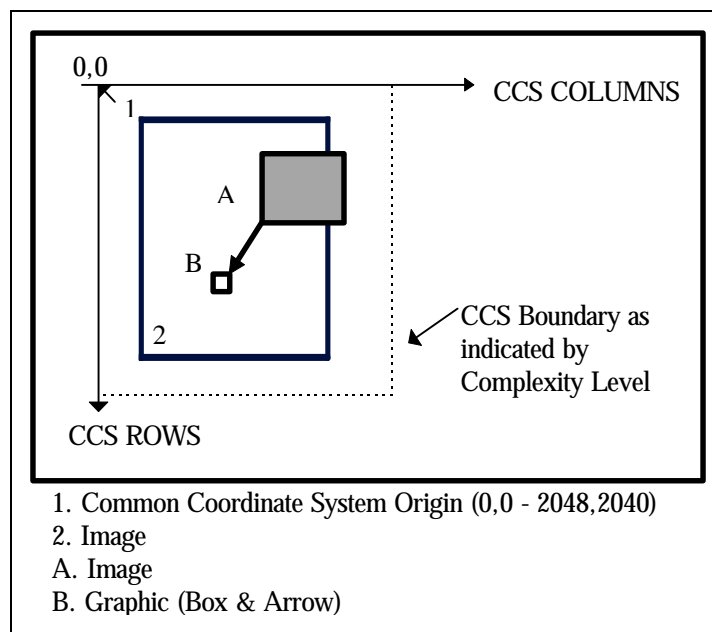


FIGURE 3. ~~File Header file/subheader-subfile~~ structure.

4.87 Common image coordinate system. The ~~NITF~~ Common Coordinate System (CCS) is the virtual two dimensional Cartesian-like coordinate space which shall be common for determining the placement and orientation of displayable data types (~~for example, images, symbols, extension data, etc.~~) within a specific NITF file and among correlated NITF files which comprise an integrated product.

4.87.1 CCS structure. The virtual CCS structure can be conceived of as a two dimensional drawing space with a coordinate system similar in structure to the lower right quadrant of the Cartesian coordinate system. The CCS has two perpendicular coordinate axes, the horizontal column axis and the vertical row axis as depicted in figure 4. The positive directions of the axes are based on the predominate scan (column) and line (row) directions used by the digital imagery community. The intersection of the axes is designated as the origin point with the coordinates (0, 0). ~~g~~Given the orientation of the axes in figure 4, the positive direction for the column axis is from (0, 0) and to the right; the positive direction for the row axis is from (0, 0) downward. The quadrant represented by the positive column and positive row axes is the only coordinate space ~~for in~~ which NITF displayable data types may be located.

FIGURE 4. Common coordinate system example.

4.87.2 Row and column coordinates. Displayable data types shall be placed in the CCS according to the row and column coordinates placed in subheader location fields (for example, ILOC, SLOC). The location coordinates of a specific data item represent row and column offsets from either the CCS origin point (when 'unattached'), or the location point in the CCS of the data item to which the item is attached. Other means used to locate displayable data shall be directly correlated to row and column coordinates. (For example, displayable tagged extension data might have geolocation data correlated with row and column indices.) When location coordinates are relative to the CCS origin, they shall always have a positive value. When location coordinates are relative to the location coordinates of an item to which they are attached, both positive and negative offset values are possible. In all cases, the location coordinates selected for any data item shall ensure that none of the displayable item extends outside of the quadrant defined by the axes of the CCS.

4.87.3 Complexity level constraints. The upper and left boundaries of the CCS are explicitly constrained in the specification. When complexity level constraints are specified, one of the key attributes for specification shall be to identify the lower and right boundary drawing space constraints for a given complexity level.

5. DETAILED REQUIREMENTS

5.1 Format Description.

5.1.1 Fixed fields. The format contains **file** header, subheader, and data fields. The NITF **file** header and subheader fields are byte aligned. A file header carries information about the identification, classification, structure, content, size of the file as a whole, and the number and size of the major component segments within the file. For each type of data segment supported by the format, there is an associated subheader and data field. The **A** subheader contains information that describes characteristics of the item, followed by an associated field that contains the actual data.

5.1.2 Extension fields. Flexibility to add support for the kinds of data and data characteristics not explicitly defined in this standard is provided within the format. This is accomplished by providing for conditional fields in each header/subheader indicating the presence of "tagged records" and providing for a group of "data extension segments." The tagged records in the headers/subheaders may contain additional characteristics about the corresponding data, while the ~~tagged data~~ **extension** segments are intended primarily to provide a vehicle for adding support for new types of data. The "tags" for the tagged records, ~~and tagged segments,~~ will be coordinated centrally to avoid conflicting use.

5.1.3 Supported ~~information~~ data types. A NITF file supports the inclusion of three standard types of data segments in a single file: image, graphic, and text **data** segments. ~~It is also possible to provide exact geolocation of image segments using standard mechanisms (see paragraph 5.8).~~ Additional types of ~~information~~ **data** may be included in a NITF file by use of Data Extension Segments (DES) (see paragraph 5.7. **1.3.1**). ~~An item~~ **Information** of a standard data type is called a standard data segment. ~~An item~~ **Information** of a type defined in a DES is called data extension segment. The order of these major file components is illustrated on figure 5.

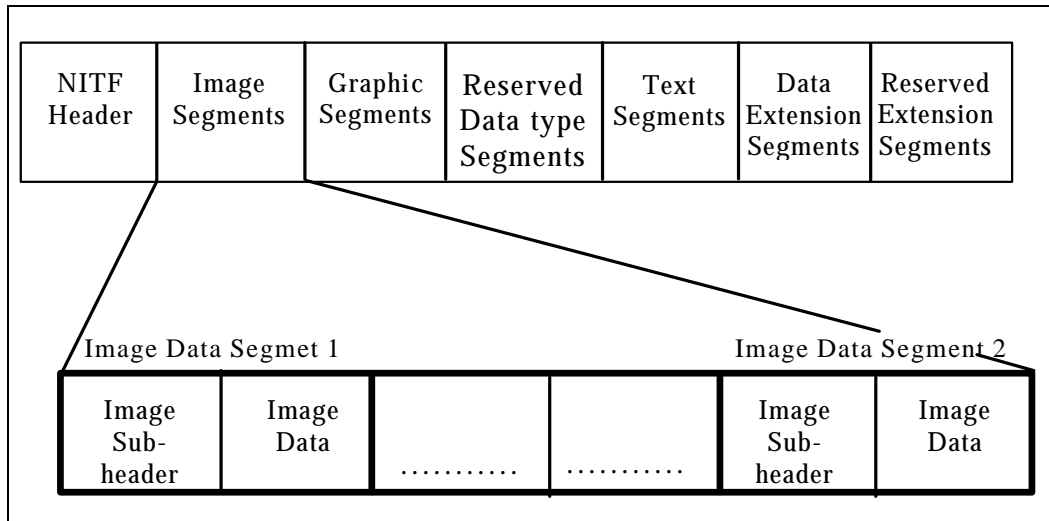


FIGURE 5. NITF file structure.

5.1.4 ~~Application guidance~~ File structure requirements. The NITF file supports inclusion of standard **data** types of information in a single file: image, graphic, and text. It is possible to include zero, one, or multiples ~~items~~ of each standard data type in a single file (for example: several images, but no graphics). Standard data types shall be placed in the file in the following order: all image ~~items (images)~~ **segments**, followed by all graphic ~~items (graphics)~~ **segments**, followed by all text ~~items~~ **segments** (documents).

5.1.5 Standard data type **segment** subheaders. Each individual, standard ~~information item~~ **data segment** included in a NITF file, such as an image or a graphic **data segment**, shall be preceded by a "subheader" corresponding to that data ~~type~~ **segment**. This subheader shall contain details of that particular data item and data type only. If no items of a given type are included in the file, a subheader for that information type shall not be included in the file. All data items and associated subheaders of a single type shall precede the first subheader for the next data type. The ordering of multiple data items of one type is arbitrary. A diagram of the overall NITF file structure is shown on figure 5.

5.1.6 Header/Subheader field specification. The specification of the fields in the various headers/subheaders found within a NITF file is provided in a series of tables in appendix A. Each table includes a mnemonic identifier for each FIELD within a header/subheader, the field's NAME, ~~with~~ a description of the valid contents of the field, and constraints on the field's use, the field SIZE, the VALUE RANGE it may contain, and

an indication of its TYPE (see paragraph 5.1.8). The NITF file header fields are specified in table A-1. The standard data type segment subheader fields are specified in tables A-3, A-3(A), A-5, and A-6. The tagged record extension subheaders (see paragraphs 5.7. ~~21~~ and 5.7. ~~21.1~~) are defined in table A-7. Finally, the data extension segment subheader fields (see paragraph 5.7. ~~2.3e1.3.1~~) and RES are defined in table A-7 and A-9. The data that appears in all header/subheader information fields specified in the tables, including numbers, shall be represented using the printable BCS character set (defined in table B-1 of appendix B) with eight bits (one byte) per character. Representing numbers in character form avoids many of the problems associated with differences in word length and internal representation among different machines. Representing the header and subheader fields in BCS also makes them more easily read by humans. All field size specifications given for the header and subheader fields specify a number of bytes. Fields that may contain any printable BCS characters (including punctuation marks) are indicated as "Alphanumeric" in the VALUE RANGE specification.

5.1.7 Field structure and default values. The NITF uses character counts to delimit header fields, as opposed to special end-of-field characters or codes or direct addressing. These counts are provided in the tables detailing the NITF header and subheader field specifications. All data in fields designated "BCS-A" shall be left justified and padded to the right boundary with BCS spaces. All data in numeric fields (BCS-N) shall be right justified and padded to the left boundary with leading zero es. The standard default value shall be spaces for alphanumeric fields and zero for numeric fields. For a few fields, a specific default may be indicated in the field description. In this case, the field description shall take precedence. All header and subheader fields contained in a NITF file shall contain either ~~valid~~ **meaningful** data (that is, data in accordance with the restrictions specified for the contents of the field in this document) or the specified default value.

5.1.8 Field types. The NITF file header and various subheaders have two types of fields: required and conditional. A required field shall be present and shall contain valid data or the specified default value. A conditional field may or may not be present depending on the value of one or more preceding (required) fields. If a conditional field is present, it shall contain valid data. When a field is conditional, its description identifies what conditions and which preceding field or fields are used to determine whether or not to include it in the file. For example, in the NITF header, if the Number of Images (NUMI) field contains the value of 2, the fields LISH001, LI001, LISH002, and LI002 will be present and must be filled with valid data. However, if the NUMI **field** contains a zero, the subheader length and image length fields are omitted.

5.1.9 Logical recording formats.

5.1.9.1 Bit and byte order.

- a. The ~~default~~ method of recording numeric data on interchange media shall adhere to the "big endian" convention. ~~The default byte ordering for numeric data fields in a given product shall be documented in its product specification.~~ In big endian format, the most significant byte in each numeric field shall be recorded and read first, and successive byte recorded and read in order of decreasing significance. That is, if an n-byte field F is stored in memory beginning at address A, then the most significant byte of F shall be stored at A, the next at A+ 1, and so on. The least significant byte shall be stored at address A+ n-1.
- b. BCS character strings shall be recorded in the order in which the data is generated . ~~Pixel arrays shall be recorded from left to right starting at the top, and non-interlaced raster scanning downward. The top left pixel shall be recorded first, and the bottom right pixel shall be recorded last.~~
- c. The most significant bit in each byte of every field, regardless of data type, shall be recorded and read first, and successive bits shall be recorded and read in order of decreasing significance.

- d. Pixel arrays shall be recorded in the order specified in the field IMODE and as discussed in paragraph 5.4.3.3. **Pixel arrays shall be recorded from left to right starting at the top, and non-interlaced raster scanning downward. The top left pixel shall be recorded first, and the bottom right pixel shall be recorded last.**

5.2 The NITF file header. Each NITF file shall begin with a header, the file header, whose fields contain identification and origination information, file-level security information, and the number and size of information items of each type, such as image segment(s), graphics segments(s), and text segment(s), contained in the file. Figure 6 depicts the NITF file header. It depicts the types of information contained in the header and shows the header's organization as a sequence of groups of related fields. The expansion of the "Image Group" illustrates how the header's overall length and content may expand or contract depending on the number of data segments of each type included in the file. The NITF header is detailed in table A-1.

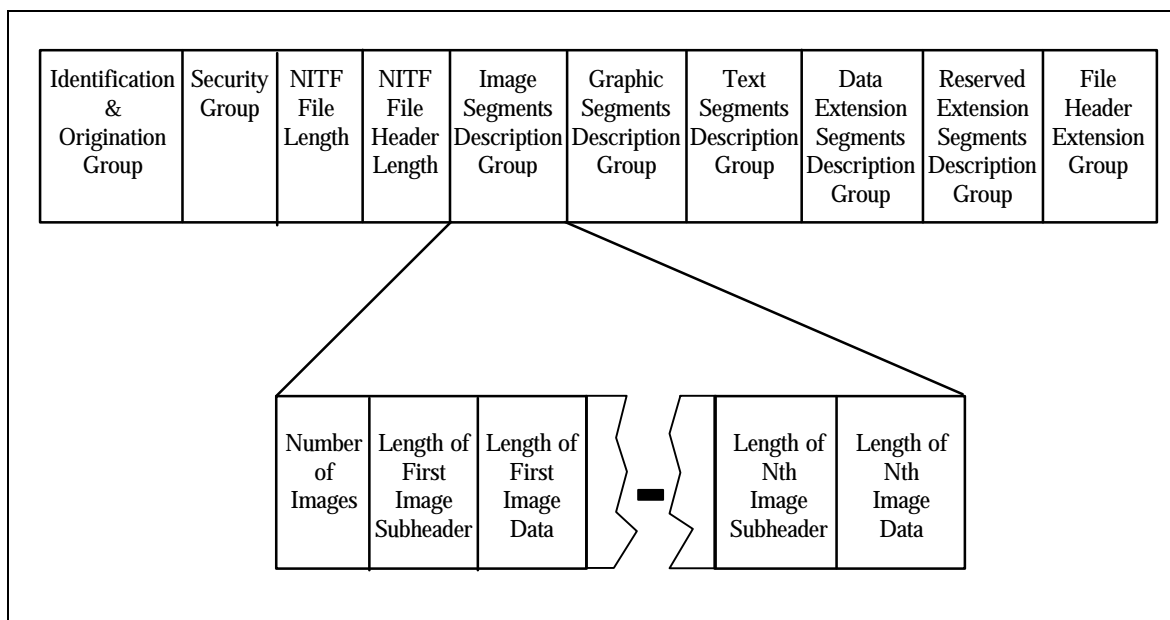


FIGURE 6. NITF file header structure.

5.3 NITF product and overlay concept. The following subsections describe the non-destructive nature of NITF and the relationships anticipated to exist among the data segments in a NITF file and how these relationships are represented in the file. An image product may conceivably consist of a correlated set of multiple NITF files; a single NITF file with multiple images, each with their own overlays and associated data; **a NITF file with no image**; and/or a single NITF file with a single image and its overlays and associated data. To facilitate description of the NITF overlay concept, only the latter case will be addressed in the context of this subsection. **See paragraph 6.2 for applying the overlay concept to the other two cases.**

5.3.1 Image overlay relationships. Each single file image product is comprised of one or more NITF standard information data segments plus associated data. The association and portrayal of displayable segments is accomplished through the use of location indices, display levels, and attachment levels. The placement of displayable data segments in the common coordinate system (see paragraph 4.8) is recorded in the location field of the segment's subheader. The relative visibility, when displayed, of the various displayable segments in the file is recorded in the file by use of the display level (the "DLVL" field in the standard information type subheaders, specifically IDLVL for images and SDLVL for graphics). Groupings of related segments may be formed by use of the attachment level (the "ALVL" field in the standard information type subheaders, specifically IALVL for images and SALVL for graphics). For example, when a base image segment is present, it may form the basis for

using the other data contained in the product. Images other than the base image may be associated with the base image via the use of the ILOC, IDLVL, and IALVL fields of their image subheaders. All images and graphics associated with the base image define overlays to the base image in the sense that, when displayed, they will overwrite the underlying portion (if any) of the base image. Images and graphics associated (attached to) with the base image may be positioned such that they are completely on the base image, are partially on the base image, or completely off (adjacent to) the base image.

5.3.2 Overlays and display level. The order in which images and graphics are "stacked" visually when displayed ~~shall be~~ **is** determined by their display level (the DLVL field in the standard information type subheaders, specifically IDLVL for images and SDLVL for graphics), not by their relative position within the NITF file. The display level is a positive integer less than 1000. Every image and graphic segment in a NITF file shall have a unique display level. That is, no two segments may have the same display level. This requirement allows display appearance to be independent of data processing or file sequence order.

5.3.3 Display level interpretation. The display level determines the display precedence of images and graphics **within a NITF file** when they are output to a display device. That is, at any pixel location shared by more than one image or graphic, the value displayed there is that determined from the segment with the highest numbered display level. ~~An example is provided on figure 7.~~ Figure 7 illustrates a sample "output presentation" from a NITF file that illustrates the effects of display level assignment. The Display Level (DL) of each segment shown on figure 7 is indicated in the list of items on figure 7. ~~, where the list is in the order that the segments were placed in the NITF file containing them.~~ In the case shown, the segment with display level one is not an image but rather an opaque CGM rectangle (graphic data, not image data). Because the CGM rectangle is larger than the base image (which, in this case, serves as the first overlay because its display level is two), it provides a border to the ~~base~~ image. Following increasing DL value, the border is overlaid by the image which, in turn, is overlaid by arrow one, which is, in turn, overlaid by the image inset, etc. ~~It is emphasized again that data segments are not displayed in the same sequence in which they may appear in the NITF file.~~ The AL values in figure 7 refer to "Attachment Levels," ~~which are described next.~~

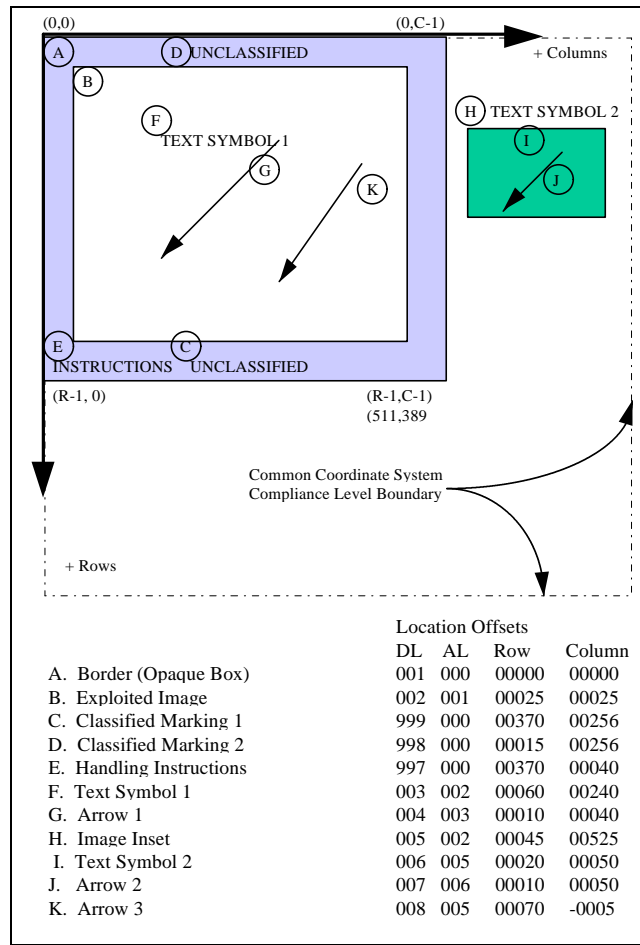


FIGURE 7. NITF display level illustration.

5.3.4 Attachment level. Attachment level (AL) provides a way to associate display segments (images and graphics) with one another so they may be treated together for certain operations such as moving them, rotating them, or displaying them as a group. The attachment level of a display **able** segment shall be equal to the display level of the ~~display~~ segment to which it is "attached." This value is stored in the "ALVL" field (specifically IALVL for images, SALVL for graphics) of the segment's subheader. A segment with Display Level 1 (**DL001**) (the minimum display level in this example), must have an attachment level of zero. An attachment level of zero shall be interpreted as "unattached." **The segment having minimum display level shall have attachment level zero and location (0,0).** Any other segment may also have AL zero, that is, be unattached. An overlay's display level shall always be numerically greater than its attachment level (that is, an overlay must be attached to something previously displayed or **it** is unattached). Figure 8 shows the attachment relationships of the overlays on figure 7. ~~In figure 7 items with AL 000 are permanently attached to the display device and are not edited in this example. The other attachment levels may be edited (moved, deleted, rotated, etc.) but are always maintained in the same relative position to the AL 001.~~ When an overlay or base is edited (moved, deleted, rotated), all overlays attached to it, directly or indirectly, may be affected by the same operation. For example, on figure 8, if the exploited image (DL 002, AL 001) were moved one centimeter to the left, the arrows (DL 003, AL 002, and DL 006, AL 005), the image inset (DL 004, AL 002), (DL002, AL 003), and the graphic (DL005, AL004) associated with the image inset also would be moved one centimeter to the left. Recognizing that because of the way the attachments have been constructed, if the graphic label (DL005, AL004) were deleted, so would be its associated arrow 2 (DL006, AL005). However, if the image inset (DL 004, AL 002) were deleted, its associated arrow 1 (DL 003, AL 002) would not be deleted. Although the attachment level

provides the means to group or associate display items, the provision of user operations (such as moving, rotating, etc.) to act on or use attachment level information is an implementor's choice.

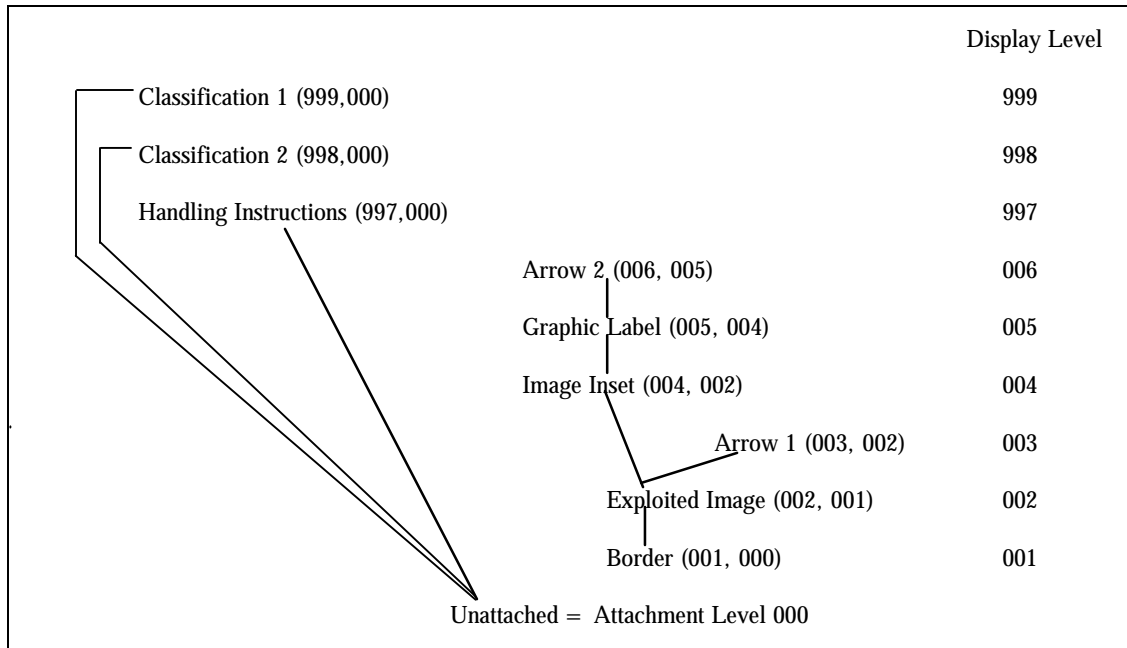


FIGURE 8. Attachment level relationship.

5.4 Image data type.

5.4.1 General. For the NITF, the image data type segment encompasses multispectral imagery and images intended to be displayed as monochrome (shades of gray), color-mapped, (pseudocolor), or true color and may include grid or matrix data intended to provide additional geographic or georeferencing information.

5.4.1.1 Image category (ICAT). The specific category of an image item reveals its intended use or the nature of its collector. The possible use of standard support data extension to provide georeferencing data depends on both the intended use of the transmitted data item and on its nature as described in table A-2.

5.4.1.2 Image representation (IREP). An image may include multiple data bands and color look-up tables (LUTs), the latter within its header fields. True color images (three band) may be specified to be interpreted using either the RGB (Red, Green, Blue) or the YCbCr (Y = Brightness of signal, Cb = Chrominance (blue), Cr = Chrominance (red)) color system. Grids or matrix data may include one, two or several bands of attribute values intended to provide additional geographic or georeferencing information. The image representation must be consistent with the image category as shown in table A-2.

5.4.2 Image model. For the NITF, an image is a **two-dimensional** rectangular array of pixels indexed by row and column. A pixel is represented by an n-vector of **pixel sample values; where n corresponds to the number of bands comprising the image.** ~~each pixel value representing the quantification of the image sample collected by a specific sensor element for the area represented by the pixel.~~ The i^{th} entry of the pixel (vector) is the pixel value for the i^{th} band **sample** of the image. Therefore, the i^{th} band of the image is the rectangular array of i^{th} sample values from the pixel vectors. For an image I with R rows and C columns, the coordinates of the image pixel located in the c^{th} column of the r^{th} row shall be denoted by an ordered pair (r,c), $0 \leq r < R, 0 \leq c < C$, where the first number, r, indicates the row and the second number, c, indicates the column in the image array. This notation is standard for addressing arrays and matrices. The pixel located at (r,c) is denoted by I(r,c). For example, a typical 24-bit RGB image is an array of R rows and C columns, where each indices (r,c), $0 \leq r < R, 0 \leq c < C$, identifies a pixel I(r,c) consisting of three single byte values (a three-vector) corresponding to

the red, green, and blue samples. The image has three bands, each consisting of a R-by-C array of single byte sample values. One band comprises the red, one band comprises the green, and the third band comprises the blue pixel sample values. Specifically, the value at position r, c in the green band, for example, contains the green byte from the pixel $I(r, c)$ three-vector at position r, c in the image.

5.4.2.1 Display of NITF images. When an image with R rows and C columns is displayed, a mapping is accomplished from the stored image pixel value array I to a rectangular array S of physical picture elements, for example a Cathode Ray Tube (CRT) display. This mapping will be called the display mapping. Usually, the resulting display has an identified top, bottom, and left and right side. In a particular application, the display mapping may be defined explicitly. However, lacking this, an image stored in a NITF file shall be interpreted so that pixel $I(0,0)$ is at the upper left corner, and pixel $I(R-1, C-1)$ is at the lower right corner. The r^{th} row of the image array I shall form the r^{th} row of the display, counting from the top, $0 \leq r < R$. Within the r^{th} row, the pixels shall appear beginning on the left with $I(r,0)$ and proceeding from left to right with $I(r,1)$, $I(r,2)$, and so on, ending with $I(r, C-1)$. Figure 9 illustrates the display mapping just described. This mapping of pixel values to physical picture elements is typical of non-interleaved raster pattern of picture elements. The relationship of the pixels $I(r, c)$ in the image array to up, down, left and right implicit in this diagram is used freely in later descriptions to simplify exposition.

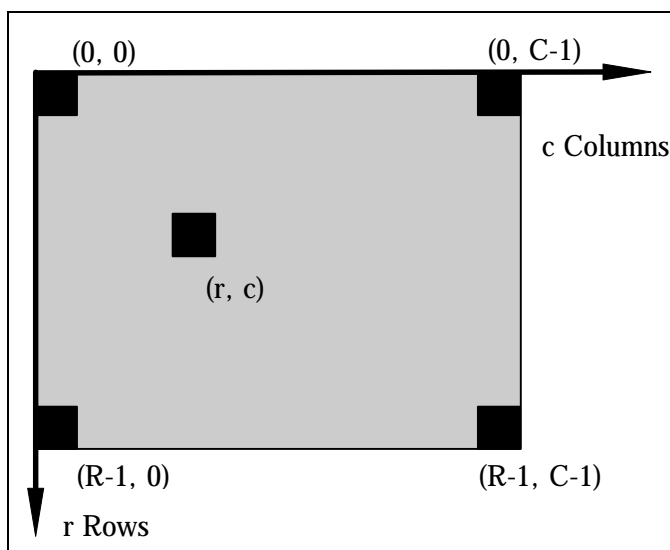


FIGURE 9. Image coordinate system.

5.4.2.2 Blocked images. ~~The concept of a subimage is introduced here to help discuss~~ blocked images, ~~which extends the image model for NITF presented above to support the representation of an image in terms of an orderly set of subimages (or subarrays) called blocks~~ For large images (e.g., those having more horizontal and vertical pixel values than typical display devices), the performance of an imagery implementation can be potentially improved by “blocking” the image; that is, ordering the pixel values in the NITF file as a series of concatenated pixel arrays.

- a. The idea behind a blocked image is ~~to view it as comprising a rectangular array of uniform, adjoining sub-arrays called blocks. A rectangular tiled floor is a suitable analogy.~~ **analogous to a rectangular tiled floor.** Regard the overall floor cover as the image and each individual tile as a block. To make this more precise, let I be an image of R rows and C columns, and let the Number of Pixels Per Block Horizontal (NPPBH), (that is, the number of columns of each block) and the Number of Pixels Per Block Vertical (NPPBV), (that is, the number of rows in each block) be positive integers that satisfy $NPPBH \leq C$ and $NPPBV \leq R$. If R is an integral multiple of NPPBV and C is an integral multiple of NPPBH, then I may be viewed as an array B of sub-arrays each of having NPPBV rows and NPPBH columns. These sub-arrays $B_{r,c}$ are called blocks. The block $B_{r,c}$ is in the r^{th} row of

blocks and the c^{th} column of blocks. The number of columns of blocks (**number of blocks per row, NBPR**) is the integer $[C/NPPBH]+1$ and $[C/NPPBH]$ if $[C/NPPBH]=C/NPPBH$, and the number of rows of blocks (**number of blocks per column, NBPC**) is the integer $[R/NPPBV]+1$ and $[R/NPPBV]$, if $[R/NPPBV]=R/NPPBV$ ($[r]:=$ largest integer $\leq r$).

- b. For recording purposes, the image blocks are ~~indexed and~~ ordered **and indexed** sequentially by rows, i.e. $B(1,1) \dots B(1,\epsilon 1, \text{NBPR})$; $B(2,1) \dots B(2,\epsilon 1, \text{NBPR})$; $B(r,\epsilon 1, \text{NBPR}) \dots B(r,\epsilon \text{NBPC}, \text{NBPR})$. The relation of image blocks to image rows and columns is depicted on figure 10 using the NITF display convention described in paragraph 5.4.2.1. Although the pixel values are placed in the file as a series of arrays (blocks), the coordinate used to reference any specific pixel remains the same as if the image were not blocked. For example, if $R=C=2048$ and $NPPBV=NPPBH=1024$, there will be four blocks in the image I. The second pixel value in $B(1,2)$ has the coordinate $I(0,1025)$ vice the internal index $(0,1)$ of the subarray.

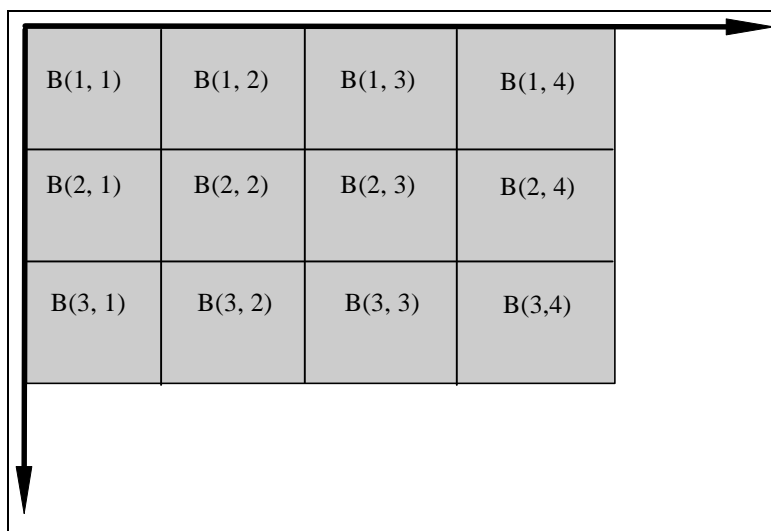
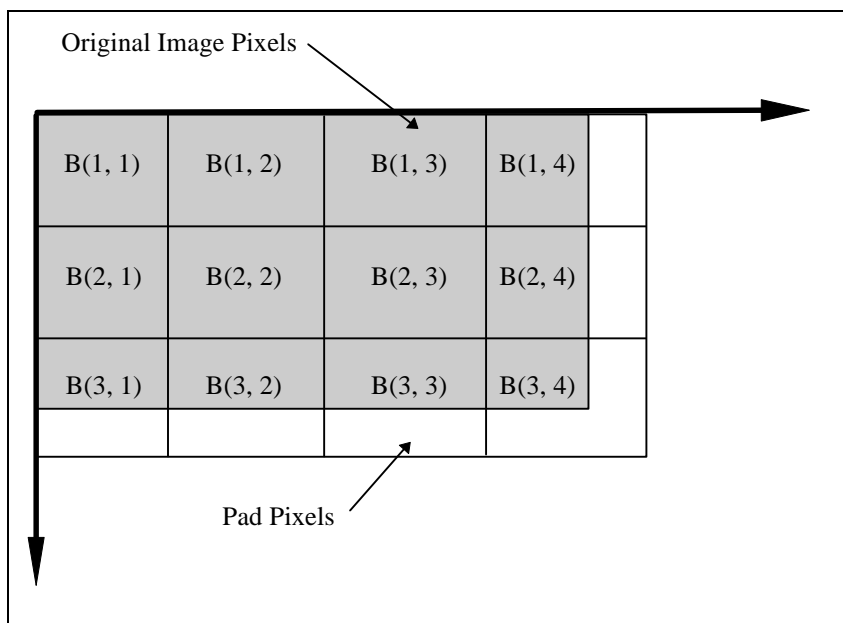


FIGURE 10. A blocked image.

- c. If the number of rows in an image is not initially an integer multiple of NPPBV, or if the number of columns is not an integer multiple of NPPBH, an application that creates the blocked image construct in NITF shall "pad" the image to an appropriate number of rows and columns so the divisibility condition is met by adding rows to the bottom and/or columns to the right side of the image, as viewed. The result is that a blocked image may have a block(s) (subarray(s)) comprised of "significant" pixels, those meaningful pixel values from the original image, and "pad" pixels (those without meaning or significance to the original image). The remaining pixels are "pad." Figure 11 illustrates this situation inserted to meet block boundary conditions.

FIGURE 11. A blocked, padded image.

5.4.2.3 Blocked image masking. In some instances, a blocked image may have a considerable number of empty blocks (blocks without meaningful pixel values). This might occur when a rectangular image is not north aligned when scanned or otherwise sampled, but has been rotated to a north up orientation (see figure 12) resulting in the need to insert "pad" pixels to maintain the rectangular raster pattern of the pixel array. In this case, it is sometimes useful to not record or transmit empty blocks within a NITF file. However, if empty blocks are not recorded/transmitted, the image loses its logical structure as an image with $n \times m$ blocks. In order to ~~preclude the loss of~~ **retain** logical structure, and to allow the exclusion of empty blocks, an image data mask table structure has been defined. ~~The image data mask table is defined in paragraph 5.4.3.2. The mask block image identifies the location of non-empty and empty blocks so that the using application can reconstruct the image correctly.~~ In figure 132, the recording order would be B(1,1); B(1,2); B(1,3); B(2,1); B(2,2); B(2,3); B(2,4); B(3,1); B(3,2); B(3,3); B(3,4); B(4,2); B(4,3); B(4,4). Blocks B(1,4) and B(4,1) would not be recorded in the file. The blocked image mask would identify the locations of the recorded image blocks. If the image is band sequential (IMODE= S), there will be multiple block image masks (one for each image band), with each mask containing NBPR (Number of Blocks Per Row) x NBPC (Number of Blocks Per Column) records. Blocked image masks can be used in conjunction with a transparent pad pixel mask, as described below. A blocked image mask may also be used to provide an index for random access within the blocked image data for large images even if all blocks are recorded in the file.

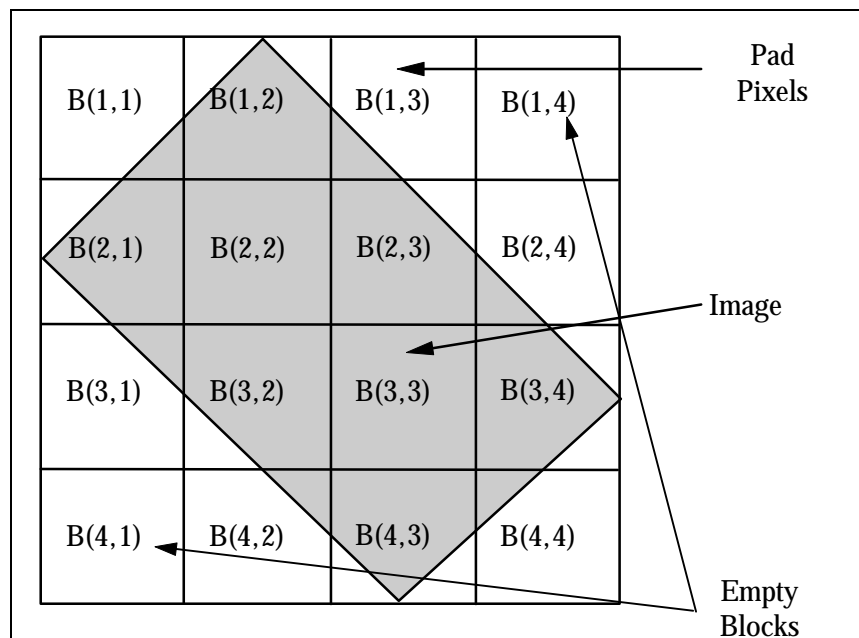


FIGURE 12. A blocked, padded image with empty blocks.

5.4.2.4 Pad pixel masking. In addition to empty image blocks, figure 12 also demonstrates that a significant number of ~~transparent~~ **pad** pixels may be needed to "fill" an image to the nearest block boundary.

- a. In the example in figure 12, the locations of image blocks ~~would be recorded, indicating that those blocks~~ B(1,1); B(1,2); B(1,3); B(2,1); B(2,3); B(2,4); B(3,1); B(3,2); B(3,4); B(4,2); B(4,3); and B(4,4) **would be recorded indicating that those blocks** have pad pixels. B(1,4); B(2,2); B(3,3), and B(4,1) do not have pad pixels because B(1,4) and B(3,1) are empty and B(2,2) and B(3,3) are full image blocks.
- b. If the image is band sequential (IMODE= S), there will be pixel masks that will be arranged in the same order as the image bands, with each mask containing Number of Blocks Per Row (NBPR) x Number of Blocks Per Column (NBPC) records.
- c. The output pixel code which represents pad pixels is identified within the image data mask subheader by the ~~Transparent~~ Output Pixel Code field (TPXCD). The length in bits of this code is identified in the ~~Transparent~~ Output Pixel Code Length field (TPXCDLNTH). Although this length is given in bits, the actual TPXCD value is stored in an integral number of bytes. When the number of bits used by the code is less than the number available in the TPXCD field (for example, a 12 bit code stored in two bytes), then the code will be justified in accordance with the PJUST field in the Image Subheader.
- d. When an application identifies pad pixel values, it may replace them with a user defined value (for example, a light blue background) at the time of presentation except when the value of TPXCD is zero (0). When the TPXCD value is zero, the pad pixel will be treated as "Transparent" for presentation. The application may ~~also~~ choose to ignore pad pixels in histogram generation. In any case, pad pixels are not valid data, and should not be used for interpretation or exploitation. Consequently, the value used for pad pixels shall not appear within the bounds of significant pixels of the image.

5.4.3 NITF image information fields. In the NITF, the information describing an image is represented in a series of adjacent fields grouped into the image subheader followed by the image data. The field containing the image data is called the image data field. The image data field shall follow immediately the last field of the

corresponding image subheader with no intervening special characters to designate the beginning of the image data field. Similarly, the image subheader of the first image shall follow immediately the last byte of data of the last field in the NITF header, and the image subheader of successive images shall follow immediately the last byte of the image data field of the preceding image.

5.4.3.1 Image subheader fields. The data in the image subheader fields are BCS character data (except for LUTs). They provide information about the image source, its identification, and characteristics needed to display and interpret it properly. The image subheader field definitions are detailed in table A-3.

5.4.3.2 Image data mask table. The image data mask table is a conditional data structure included in the image data stream for masked images when so indicated by the Image Compression field value (IC values NM, M1, M3, M4 and M5). The image data mask ~~subheader~~ **table** is not recorded for non-masked images (IC values NC, C1, C3, C4 and C5). The image data field of a masked image is identical to that of non-masked images except for the following: the first byte of the image data is offset from the beginning of the image data field by the length of the image data mask table(s); and empty image blocks are not recorded/transmitted in the image data area. If the image is band sequential (IMODE= S), there will be multiple blocked image and/or pad pixel masks (one for each band). All blocked image masks will be recorded first, followed by all pad pixel masks. Since the image data mask tables are in the image data area, the data recorded/transmitted there are binary. The structure of the image data mask table is defined in detail in table A-3(A).

5.4.3.3 Image data format. Image data may be stored in a NITF file in either uncompressed or compressed form.

5.4.3.3.1 Uncompressed image data format. The order in which pixel values of a single band image are stored is fixed. When an image has more than one band, several options are available for the order in which pixel values are stored. The option used is indicated by the IMODE field in the image subheader. The following subparagraphs describe the possibilities within this format. In describing the encoding of image data, the NITF display convention is invoked freely for ease of expression. Let the image to be encoded be denoted by I , and assume I has R rows and C columns. Let I have n bands; that is, each pixel is an n -vector, the i^{th} value of which is the value for that pixel location of the i^{th} band of the image. Let N denote the number of bits-per-pixel-per-band. Thus, there are $n*N$ bits-per-pixel. Let I be blocked with H blocks per row and V blocks per column. Note that special cases such as single band images and single block images are included in this general image by setting $n=1$, and $H=V=1$, respectively.

5.4.3.3.2 Single band image uncompressed data format. For single band images, $n=1$, and there is only one order for storing pixels. The field IMODE in the image subheader shall be set to B for this case. The blocks (one or more) shall be stored, one after the other starting with the upper left block and proceeding first left to right across rows of blocks, one row of blocks after the other, top to bottom. Image data within each block shall be encoded as one continuous bit stream, one pixel value after another, beginning with the N bits of the upper left corner pixel, $I(0,0)$, followed by the N bits of $I(0,1)$ and so on until all pixels from the first row in the block are encoded. These shall be followed immediately by the N bits of data for pixel $I(1,0)$ continuing from left to right along each row, one row after another from the top of the block to the bottom. The last byte of each block's data is zero-filled to the next byte boundary, but all other byte boundaries within the block are ignored. See the field Pixel Value Type (PVTYP) description in table A-3 for the specification of the bit representation of pixel values.

5.4.3.3.3 Multiple band image uncompressed data format. For multiple band images, there are three orders for storing pixels.

5.4.3.3.3.1 Band sequential. The first case is "band sequential", in which each band is stored contiguously, starting with the first band, one after the other, until the last band is stored. Within each band the data shall be encoded ~~multiple~~ as if it were a single band image with one or more blocks (see paragraph 5.4.3.3.2.1). The field IMODE in the image subheader shall be set to S for this case. This case is only valid for

images with multiple blocks and multiple bands. (For single block images, this case collapses to the "band interleaved by block" case where IMODE is set to B.)

5.4.3.3.2.2 Band interleaved by pixel. The ordering mechanism for this case stores the pixels in a block sequential order in which each block is stored contiguously, starting with the upper left block and proceeding first left to right across rows of blocks, one row of blocks after the other, top to bottom. ~~Within each block, the multiple band image data can be stored in one of two ways, either interleaved by pixel or by block.~~ For "band interleaved by pixel" the $n \times N$ bits of the entire pixel vector are stored pixel-by-pixel in the same left to right, top to bottom pixel order as described in paragraph 5.4.3.3.2.1. The $n \times N$ bits for a single pixel are stored successively in this order: the N bits of the first band followed by the N bits of the second band and, so forth, ending with the N bits of the last band. Each block shall be zero-filled to the byte boundary. The field IMODE in the image subheader shall be set to P for this storage option. See the field Pixel Value Type (PVTYP) description in table A-3 for the specification of the bit representation of pixel values for each band.

5.4.3.3.2.3 Band interleaved by block. The ordering mechanism for this case stores the pixels in a block sequential order where each block is stored contiguously, starting with upper left block and proceeding first left to right across rows of blocks, one row of blocks after the other, top to bottom. ~~Within each block, the multiple band image data can be stored in one of two ways, either interleaved by pixel or by block.~~ For "band interleaved by block" the data from each block is stored starting with the first band, one after the other until the last band is stored. Each block shall be zero-filled to the next byte boundary. The field IMODE in the image subheader shall be set to B for this storage option. See the field Pixel Value Type (PVTYP) description in table A-3 for the specification of the bit representation of pixel values for each band.

5.4.3.3.2 Compressed image data format. The format of the image data after compression is provided with the description of the NITFS image compression algorithms in ~~CCITT Recommendation ITU-T T.4 (1993.03), AMD2 08/95, ISO/IEC 10918-1, ISO/IEC 10918-3, and MIL-STD-188-199 (TBD).~~ Also found in these references are the conditions the data must meet before a given compression method can be applied meaningfully.

5.4.3.4 Grayscale look-up tables (LUT). The grayscale to be used in displaying each pixel of a grayscale image is determined using the image's LUT, if present. A LUT for a grayscale image when present, shall comprise a one byte entry for each integer (the entry's index) in the range 0 to NELUT -1. The bytes of the LUT shall appear in the file one after the other without separation. The entries shall occur in the index order, the first entry corresponding to index 0, the second to index 1 and so on, the last corresponding to index NELUT-1. The display shade for a pixel in the image shall be determined by using the image pixel value as an index into the LUT. The LUT value shall correspond to the display grayscale shade in a way specific to the display device. NELUT shall be equal to or greater than the maximum pixel value in the image to ensure that all image pixels are mapped to the display device. ~~The presence of color LUTs is optional for 24 bit per pixel (true color) images. Pseudo-color (e.g. 8 bit per pixel color images) shall contain a LUT to correlate each pixel value with a designated true color value.~~

5.4.3.5 Color look-up tables (LUT). Color images are represented using the RGB color system notation. For color images, each LUT entry shall be composed of the output color components red, green, and blue, appearing in the file in that order. There shall be a LUT entry for each pixel value in a particular band of a NITF image (the entries index of the LUT will range from 0 to NELUT-1). The LUT entries shall appear in the file in increasing index order beginning with index 0. The display color of an image pixel shall be determined by using the pixel value as an index into each LUT (red, green, blue). The corresponding values for red, green, and blue shall determine the displayed color in a manner specific to the display device. The color component values may be any of the 256 pixel values associated with the band. **The presence of color LUTs is optional for 24 bit per pixel (true color) images. Pseudo-color (e.g. 8-bit per pixel color images) shall contain a LUT to correlate each pixel value with a designated true color value.**

5.5 Graphic data type. ~~The graphic data type~~ is used in the NITF to store a two-dimensional ~~graphic segment information~~ represented as a Computer Graphics Metafile (CGM). Each graphic segment consists of a

graphic subheader and data. A graphic ~~item~~ may be black and white, gray scale, or color. Examples of graphics are circles, ellipses, rectangles, arrows, lines, triangles, logos, unit designators, object designators (ships, aircraft), text, and special characters. A graphic is stored as a distinct unit in the NITF file allowing it to be manipulated and displayed nondestructively relative to the images, and other graphics in the file. This standard does not preclude the use of n-dimensional graphics when future standards are developed.

5.5.1 Graphic subheader. The graphic subheader is used to identify and supply the information necessary to display the graphic data as intended by the file builder. The format for a graphic ~~item~~ **subheader** is detailed in table A-5.

5.5.2 Graphic data format. ~~For purposes of this document, +~~ The graphic format is CGM as described in ISO/IEC 8632-1:1992, Information Technology - Computer Graphics Metafile for Storage and Transfer of Picture Description, 1992. The precise tailoring of the CGM standard to NITF is found in MIL-STD-2301.

5.5.2.1 CGM graphic bounding box. CGM graphic placement is defined by the SLOC (graphic location) field and the CGM graphic extent is given by the SBND1 (graphic bound 1) and SBND2 (graphic bound 2) fields. SLOC defines the origin for the CGM coordinate system. The area covered by the CGM graphic is defined by a bounding box. The bounding box is the smallest rectangle that could be placed around the entire CGM graphic. The first bounding box coordinate (SBND1) is the upper left corner of the rectangle. The second bounding box coordinate (SBND2) is the lower right corner of the rectangle. SBND1 and SBND2 are values in the coordinate system defined by the attachment level. For attachment level 0, this would be the common coordinate system. The SBND1 and SBND2 values are calculated by adding SLOC to the coordinate values for the bounding box (upper left and lower right) corners as given in the CGM graphic coordinate system.

5.6 Text data type. ~~The +~~ **Text information type data** shall be used to ~~store a file or~~ store a textual based file or an item of text, such as a word processing file or document. Text ~~items are~~ is intended to convey information about the image product contained in the NITF file.

5.6.1 Representation of textual information. The NITF uses two different categories of textual character representations: text only and mark-up text (e.g. word processor form **atted** text). Each category has a set of lexical levels which constrain the use of characters within the category. The three lexical levels are: BCS, BCS-E, and UCS.

5.6.1.1 Basic Character Set. The Basic Character restricts the allowable characters to a relatively small set that can be represented in 8-bit per character codes. This character set is selected from ISO/IEC 10646 -1, but uses only the 'Cell-octet' of the basic coding structure described in ISO/IEC 10646 -1. The BCS uses only the 'Cell-octet' of the two-octet Basic Multilingual Plane form, implementation level 1, of ISO/IEC 10646 -1. ~~BCS can also be used for text data.~~ The range of allowable characters for BCS-A consists of the following: (all printable 7-bit characters plus)

Line feed	code 0A
Form feed	code 0C
Carriage Return	code 0D
Space through Tilde	codes 20 through 7E (BMP block 'BASIC LATIN')

5.6.1.1.2 BCS Basic Character Set - extended (BCS-E). The BCS-E extends the BCS set of character codes to include codes 80 through FF of the BMP block BASIC LATIN, (all printable 8-bit characters plus LF, FF, and CR).

5.6.1.23 Universal Multiple Octet Coded Character Set (UCS). The UCS is used for expressing text in many languages of the world as defined by ISO 10646 -1. The specific character set selected from UCS shall be

identified by profile. The profile shall identify the adopted form, the adopted implementation level and the adopted subset (list of collections and/or characters) in accordance with the structures defined in ISO 10646 -1. When a profile defined UCS is used in a NITF file, the coding shall contain an explicit declaration of identification of features (escape sequence) as specified in ISO 10646 -1. When no declaration escape sequence is included, the default shall be that defined for BCS -A above.

5.6.2 Text data subheader. The text subheader is used to identify and supply the information about the text file necessary to read and display the text data. The text subheader is detailed in table A-6.

~~5.7 Standard spatial support data extensions. This paragraph specifies the format and content of a set of controlled tagged record extensions for the NITF. Detailed descriptions are provided for the overall structure, as well as specification of the valid data content and format, for all fields defined within each specified support data extension (SDE). In addition, technical information is presented to provide a general understanding of the significance of the included fields.~~

~~5.7.1 Appropriate support data. That set of support data needed to accomplish the mission of a system receiving a NITF file is referred to as "appropriate" support data. The appropriate support data may vary across systems receiving NITF files. A system receiving a NITF file may add or subtract support data before passing the file to another system with a different mission. This strategy implies a modular support data definition approach.~~

~~5.7.2 NITF file containing georeferenced image, matrix, or raster map data. Image and raster map providers produce NITF files with support data from other formats which also contain support information. The extensions described herein define the format for that support information required within a NITF file containing georeferenced image, matrix, or raster map data such as that defined in the DIGEST standard. The specified tagged records incorporate all SDEs relevant to georeferenced image, matrix, or raster map data such as that defined in the Digital Geographic Information Exchange Standard (DIGEST). The information which makes up the SDE is derived from referenced standards including DIGEST. Systems using DIGEST and/or the National Imagery and Mapping Agency's (NIMA's) imagery, matrix, or raster map data formatted according to NITF should be designed to extract the needed data from the tagged records described herein. The categories of image items in a NITF file, to which the standard support extensions apply, are shown in table I.~~

TABLE I. Categories of Image/Matrix/Grid Data

Categories of Image/Matrix/Grid Data			Data extension to be included in the image-subheader		
Definition	ICAT	IREP	ACCURACY	LOCATION	SOURCE
Raster Maps	MAP	MONO, RGB, RGB/LUT	ACCPO or ACCHZ & ACCVT	GEOPS + one of: GEOLO MAPLO GRDPS REGPT	SOURC RPFDES
Legends	LEG	MONO, RGB, RGB/LUT			
Color Patch	PAT	RGB			
Georeferenced Imagery	VIS, SL, TI, FL, RD, EO, OP, HR, HS, CP, BP, SAR, IR, MS	MONO, RGB, RGB/LUT, MULTI	ACCHZ	GEOPS + one of: GEOLO MAPLO GRDPS REGPT	SNSPS
Matrix Data (elevations)	DTEM	1D, ND	ACCPO or ACCHZ & ACCVT	GEOPS + one of: GEOLO MAPLO GRDPS REGPT	SOURC
Matrix Data (other)	MATR	1D, ND	ACCPO or ACCHZ & ACCVT	GEOPS + one of: GEOLO MAPLO GRDPS REGPT	SOURC
Location Grid	LOCG	2D			

5.7.3 Georeferenced image, raster map, matrix, or grid data SDEs. The following SDEs are defined for use with georeferenced image, raster map, matrix, or grid data:

a. For spatial location:

- GEOPS — for georeferencing parameters including datums, ellipsoids, and projections
- GRDPS — for non-rectified image, raster, or matrix data that is positioned using a location grid
- GEOLO — for image, raster, or matrix data rectified consistently with geographic (lat/lon) coordinate systems
- MAPLO — for image, raster, or matrix data rectified consistently with cartographic (E,N) coordinate systems
- REGPT — for registration points in either geographic or cartographic systems

b. For positional accuracy:

- ACCPO — for horizontal and vertical accuracies over regions for which the definitions are constant

~~ACCHZ — for horizontal accuracies when the vertical accuracies vary across the region for which horizontal accuracies are constant~~
~~ACCVT — for vertical accuracies when the horizontal accuracies vary across the region for which vertical accuracies are constant~~

~~Positional accuracy description is requested when spatial location is defined.~~

~~c. For source description:~~

~~SNSPS — for sensor parameters~~
~~SOURC — for map source information~~

~~d. For NIMA's Raster Product Standard (CADRG and CIB):~~

~~RPFDES — includes multi-region accuracies, datums, ellipsoids, projections, grid North, grid convergence angles, magnetics, legends, navigation systems, and source map identifications by series and dates.~~

~~5.7.4 Aliases. Several extensions are similar to existing and proposed extensions developed by other programs, and can be considered aliases to those extensions. Reserved data fields maintain alignment between the original and aliased extensions where original fields are not applicable to DIGEST data.~~

~~5.7.5 Generic tagged extension mechanism. The tagged record extensions defined in this document are "controlled tagged record extensions" as defined in paragraph 5.8.1.2 of this standard. The tagged record extension format is summarized here for ease of reference. Table II describes the general format of a controlled tagged record extension. The CETAG, CEVER, and CEL fields essentially form a small (11 byte) tagged record subheader. The format and meaning of the data within the CEDATA field is the subject of this document for several individual controlled tagged record extensions. Multiple tagged extensions can exist within the tagged record extension area. There are several such areas, each of which can contain 99,999 bytes worth of tagged extensions. There is also an overflow mechanism, should the sum of all tags in area exceed 99,999 bytes. The overflow mechanism allows for up to one gigabyte of tags. While the extensions defined in this document will typically be found in the image subheader (IXSHD field), it is possible that they could appear in a Data-Extension Segment which is being used as an overflow of the image subheader.~~

~~5.7.6 Field types. If the information contained within an extension is not available, the extension will not be present in the file. For example, if positional accuracy is homogeneous across the whole data set extension, then the Horizontal and Vertical Accuracy Records will not appear since all of the accuracies will be contained in the Positional Accuracy Record. When an extension is present, all of the information listed as Required (type = R) must be filled in with valid information.~~

TABLE II. ~~Controlled tagged record extension format.~~
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Type Identifier. This field shall contain a valid alphanumeric identifier properly registered with the ISMC.	5	(BCS-A)	R
CEVER	Version. This field shall contain a version letter. The original version of tagged record extension shall be "A." Subsequent versions shall be designated "B," "C," ... "Z" (uppercase letters).	1	(BCS-A) A to Z	R
CEL	Length of CEDATA Field (Number of Bytes). This field shall contain the length, in bytes, of the data contained in CEDATA. The tagged record's length is 11 + the value of CEL.	5	(I) 00001 to 99999	R
CEDATA	User defined Data. This field shall contain data of either binary or character data types defined by and formatted according to user specification. The length of this field shall not cause any other NITF field length limits to be exceeded but is otherwise fully user defined.	*	User defined	R

* equal to value of CEL field.

5.87 Future expansion. Future expansion of the NITF is supported in two ways: (1) built-in mechanisms and procedures to allow ~~immediate~~ inclusion of user-determined and user-defined data characteristics and types of data without changing this standard, (but configuration managed thru a central "registry"), and (2) a collection of data fields called Data Extension Segments and Reserved Extension Segments providing space within the file structure for adding entirely unspecified future capabilities to this standard. Addition of further data characteristics beyond those specified in this standard is accomplished using the User Defined Data (UDHD and UDID), Extended Header Data (XHD), and Extended Subheader Data (IXSHD, SXSHD, and TXSHD) fields. Use of these fields is described in paragraphs 5.87.1.1 and 5.87.1.2. Addition of new types of data items is accomplished using Data Extension Segments defined in paragraph 5.87.1.3.1. Extensions of all types may be incorporated into the file while maintaining backward compatibility since the byte count mechanisms provided allow applications developed prior to the addition of newly defined data ~~to~~ to skip over extension fields they are not designed to interpret.

5.87.1 Tagged record extensions. Variations of the same basic extension mechanism, tagged records, are used for all extensions except the Reserved Extension Segments, which will be discussed separately. There are three varieties of tagged record extensions: registered extensions, controlled extensions, and encapsulated extensions. Figure 13 illustrates the concepts and formatting descriptions in paragraphs 5.87.1.1 through 5.87.1.32. A current listing of the tagged record extensions that have been registered with NIMA is provided in the Tag Registry maintained by the Joint Interoperability Test Command (JITC).

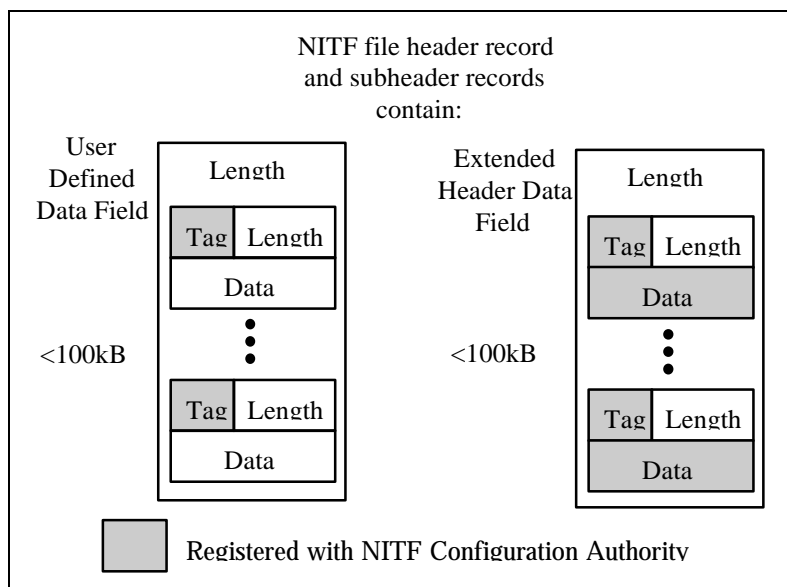


FIGURE 13. Data extension format.

5.87.1.1 Registered extensions. Each registered tagged record extension consists of three required fields. These fields are defined in table A-7. These extensions are user-defined . . . and . . . The six character RETAG field, the purpose of the tag and the overall structure of the REDATA field shall be registered with the NIMA. The purpose of registering the tags is to avoid having two users use the same tag to mean different extensions. A sequence of registered tagged record extensions can appear in the NITF header User Defined Header Data field, UDHD, or any image subheader in its User Defined Image Data field, UDID. When the tagged record extension carries data associated with the file as a whole, it should appear in the UDHD field, if sufficient room is available. If the extension carries data associated with an image information item in the file, it should appear in the UDID field of that item's subheader, if sufficient room is available. A registered tagged record extension may appear in a Data Extension Segment (see paragraph 5.87.1.3 and subparagraphs) that is designated to contain registered tagged record extensions, but only if sufficient space is not available in the UDHD or a UDID, as appropriate. A registered tagged record extension shall be included in its entirety within the UDHD, a single UDID, or the single DES selected to contain it. A registered tagged record extension may not "overflow" record fields.

5.87.1.2 Controlled extensions. These extensions are defined and submitted to the NIMA for approval by the ISMC and, once accepted are subject to configuration management by the ISMC. They are documented in a series of documents maintained by the JITC. The tagged record format for controlled extensions is identical to that for registered extensions (detailed in table A-7) except that the first two letters of each field identifier change from "RE" to "CE." The six character CETAG field and the structure of the CEDATA data field shall be registered and configuration controlled. A sequence of controlled tagged record extensions can appear in the XHD field of the NITF file header or in the IXSHD, SHSHD, or TXSHD field of a standard information item in the file. When the controlled tagged record extension carries data that is associated with the file as a whole, it should appear in the XHD field, if sufficient room is available. If the extension carries data associated with an information item in the file, it should appear in the IXSHD, SHSHD, or TXSHD field of that item's subheader, if sufficient room is available. A controlled tagged record extension may appear in a Data Extension Segment (see paragraph 5.87.1.3 and subparagraphs), which is designated to contain controlled tagged record extensions, but only if appropriate. A controlled tagged record extension shall be included in its entirety within the XHD, a single IXSHD, SHSHD, or TXSHD or the single DES selected to contain it. A single controlled tagged record extension may not "overflow" file fields.

5.87.1.3.3 Encapsulated extensions. These extensions are similar to the controlled extensions in that each has a tag, and in this case, the tag versions are controlled with the ~~ISMC~~ **tag registration process**. Each encapsulated extension shall appear in its own Data Extension Segment (DES) and shall conform to the DES structure, **in figure 14**.

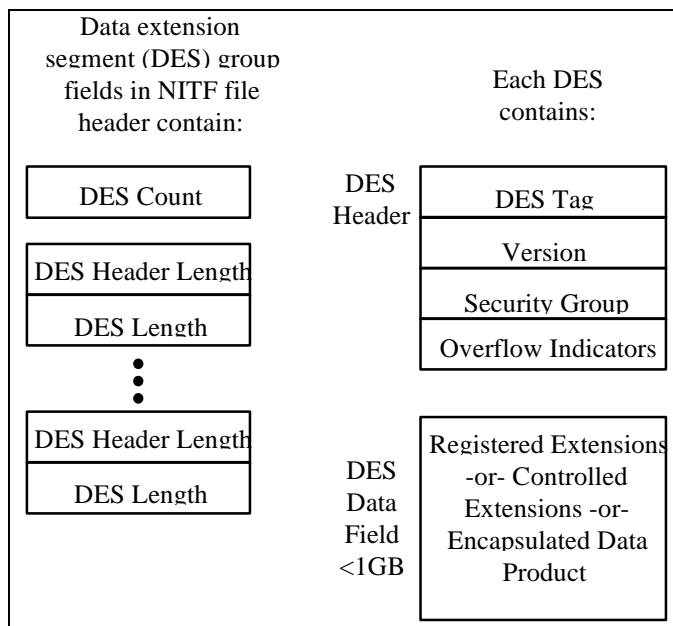


FIGURE 14. Data extension segment format.

5.87.1.3.1 ~~Data extension segment~~ DES structure. The NITF header accommodates up to 999 DESs. Each DES shall consist of a DES subheader and a DES data field (similar to the way a standard information type item has a subheader and an adjacent associated data field). Within the Data Extension Segment Group in the NITF Header is found the number of DES in the file, the length of each DES subheader, and the length of the DES data field, DESDATA. The field size specifications in the NITF file header allow each DES to be just less than one gigabyte in length. The DES subheader is detailed in table A-8. The structure provided in the DES by the fields DESSL, DESSH, and DESDATA is intended to encourage the formation of a DES along the lines of the standard information types in the NITF, in which a group of BCS fields describing the data is followed by the data itself.

5.87.1.3.2 Use of DES. The data in an encapsulated extension are anticipated to be defined typically by a specific version of a specific standard or product specification. Encapsulated extensions allow the incorporation of data products in a NITF file to be disseminated along with an image. For example, Digital Terrain Elevation Data (DTED), Digital Feature Analysis Data (DFAD), or other georeferenced products could be distributed along with an image product to support analysis and interpretation of the image. Audio and video segments are additional examples of data that may be added to the NITF through the use of Data Extension Segments.

5.87.1.3.3 Reserved DES tags. There are two reserved tags: "Registered Extensions" and "Controlled Extensions." These tags are for use when a series of registered or controlled, tagged record extensions is to appear in a DES (see paragraphs 5.87.1.1 and 5.87.1.2) as "overflow" from the NITF file header or any subheader. Which header or subheader overflowed is indicated in the DESOFL and DESITEM field contents.

5.87.2 Reserved extension segments. Structure is provided in the NITF file header to support up to 999 distinct reserved extension segments to support up to 9999999 bytes plus a corresponding subheader of up to 9999 bytes for each subheader extension. The combination of each subheader and corresponding data field is

called a Reserved Extension Segment. These fields are reserved in that they shall not be present in any header until this is modified to define their use. However, upon receipt of a file that contains a RES(s) an NITF compliant implementation shall at least ignore the RES(s) and properly interpret the other legal components of the NITF file. See the definition of the field NUMRES, and the fields that follow it (LRESHmnn and LREnn) in table A-1. The RES subheader is detailed in table A-9.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Example NITF file.

6.1.1 Use of NITF. Though the NITF was conceived initially to support the transmission of a file composed of a single base image, image insets (subimage overlays), graphic overlays, and text, its current form makes it suitable for a wide variety of file exchange needs. One of the flexible features of the NITF is that it allows several items of each data type to be included in one file, yet any of the data types may be omitted. Thus, for example, the NITF may equally well be used for the storage of a single portion of text, a single image or a complex composition of several images, graphics, and text. The following section discusses an example NITF file of moderate complexity.

6.1.2 Example file. Table A-4 shows the contents of the fields in the header of a **sample example** NITF file composed of **two base image segments** (one base image, one inset image ~~overlay~~), five graphic overlays, and five text selections. Figure 145 shows **part of** the sample file as a composite image with its overlay graphics. In an NITF file, the data for each data item is preceded by the item's subheader. The subheader for a data type is omitted if no items of that type are included in the file. Subheader field contents for items in the sample file are shown in tables H through I.

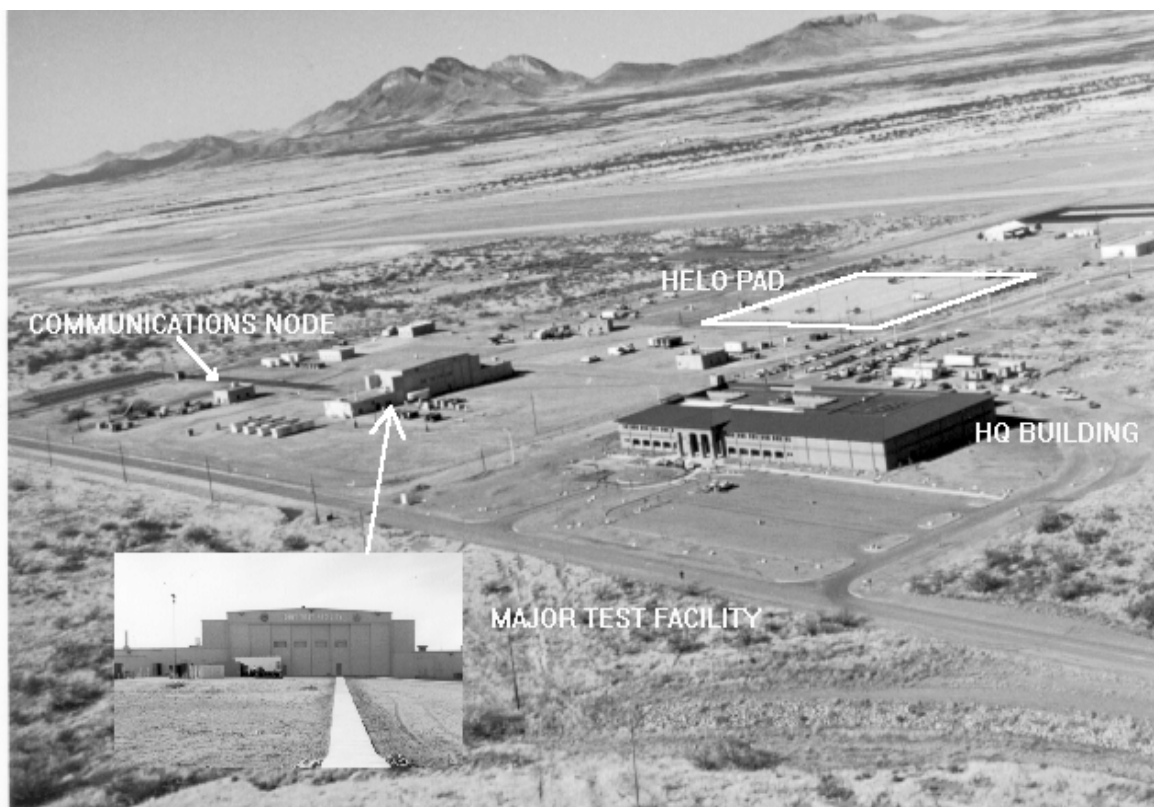


FIGURE 15. Sample file composite image.

TABLE III. Example NITF file header.

NITF HEADER FIELD	FORMAT	COMMENT
File Type & Version (FHDR)	NITF02.10	9 characters
Compliance Complexity Level (CLEVEL)	045	2 characters -- images less than or equal to 4k x 4k
System Type (STYPE)		4 blank characters
Originating Station ID (OSTAID)	U21SOO90	8 characters with 2 spaces
File Date & Time (FDT)	19960930224632	14 characters
File Title (FTITLE)	MAJOR TEST FACILITY	19 characters followed by 601 spaces - 80 characters
File Security Classification (FSCLAS)	U	1 character
File Codewords (FSCODE)		40 spaces
File Control & Handling (FSCTLH)		40 spaces
File Releasing Instructions (FSREL)		40 spaces
File Classification Authority (FSCAUT)		20 spaces
File Security Control Number (FSCTLN)		20 spaces
File Security Downgrade (FSDWNG)		6 spaces
File Copy Number (FSCOP)	00000	5 digits - all zeros indicate there is no tracking of file copies
File Number of Copies (FSCPYS)	00000	5 digits - all zeros indicate there is no tracking of file copies
Encryption (ENCRYP)	0	Required default no encryption
Originator's Name (ONAME)	W. Tempel	9 characters followed by 18 spaces - 27 characters
Originator's Phone Number (OPHONE)	44 1480 84 5611	15 characters followed by 3 spaces - 18 characters
File Length (FL)	000002925155	12 digits
NSIF NITF File Header Length (HL)	000515	6 digits
Number of Images (NUMI)	002	3 digits
Length of 1st Image Subheader (LISH001)	000679	6 digits
Length of 1st Image (LI001)	0002730600	10 digits
Length of 2nd Image Subheader (LISH002)	000439	6 digits
Length of 2nd Image (LI002)	0000089600	10 digits

TABLE III. Example NITF file header - Continued.

NITF HEADER	FORMAT	COMMENT
Number of Graphics (NUMS)	005	3 digits
Length of 1st Graphic Subheader (LSSH001)	0258	4 digits
Length of 1st Graphic (LS001)	000122	6 digits
Length of 2nd Graphic Subheader (LSSH002)	0258	4 digits
Length of 2nd Graphic (LS002)	000122	6 digits
Length of 3rd Graphic Subheader (LSSH003)	0258	4 digits
Length of 3rd Graphic (LS003)	000150	6 digits
Length of 4th Graphic Subheader (LSSH004)	0258	4 digits
Length of 4th Graphic (LS004)	000112	6 digits
Length of 5th Graphic Subheader (LSSH005)	0258	4 digits
Length of 5th Graphic (LS005)	000116	6 digits
Reserved for future use (NUMX)	000	3 digits
Number of Text Files (NUMT)	005	3 digits
Length of 1st Text Subheader (LTSH001)	0282	4 digits
Length of 1st Text File (LT001)	20000	5 digits
Length of 2nd Text Subheader (LTSH002)	0282	4 digits
Length of 2nd Text File (LT002)	20000	5 digits
Length of 3rd Text Subheader (LTSH003)	0282	4 digits
Length of 3rd Text File (LT003)	20000	5 digits
Length of 4th Text Subheader (LTSH004)	0282	4 digits
Length of 4th Text File (LT004)	20000	5 digits
Length of 5th Text Subheader (LTSH005)	0282	4 digits
Length of 5th Text File (LT005)	20000	5 digits
Number of Data Extension Segments (NUMDES)	000	3 digits

TABLE III. Example NITF file header - Continued.

NITF HEADER	FORMAT	COMMENT
Number of Reserved Data Extension Segments (NUMRES)	000	3 digits
User Defined Header Data Length(UDHDL)	00000	5 digits
Extended Header Data Header Length (XHDL)	00000	5 digits

6.1.2.1 Explanation of the file header. The File Type and Version, NITF02.10, is listed first. The next field contains the file's Complexity Level, in this case 04. A four character reserved field for the System Type, defaulted to blanks, appears next. An identification code containing ten characters for the station originating the primary information in the file is given next. The file origination date and time follow this and are given in UTC (Zulu) time format. This is followed by the File Title field containing up to 80 characters of free form text. The title of the sample file contains less than 80 characters, and therefore, the remainder of the field is padded with blanks. The File Security Classification follows and contains one character. Several security-related optional fields and a conditional field follow. They are File Codewords, File Control Handling, File Releasing Instructions, File Classification Authority, File Security Control Number, File Security Downgrade, File Copy Number, and File Number of Copies. File Encryption is given a "0" indicating that the file is not encrypted. The originator's name and phone number are given next. These fields may be left blank. Then the length in bytes of the entire file is given, including all headers, subheaders, and data. This is followed by the length in bytes of the NITF file header. The Number of Images field contains the characters 002 to indicate two images are included in the file. This is followed by six characters to specify the length of the first image subheader, then ten characters for the length of the first image. The length of the second image subheader and the length of the second image follow. The next item in the file header is the Number of Graphics, which contains 005 to indicate that five graphics are present in the file. The next ten characters contain the Length of Graphic Subheader and Length of Graphic (four and six characters respectively) for the first through fifth graphic, one after the other. The field, Number of Text Files, is given as 005 and is followed by four characters specifying the length of the text subheader and five characters specifying the number of characters in the text segment for each of the five text segments. The Number of Data Extension Segments and Number of Reserved Extension Segments fields are given as "000." This completes the "roadmap" for separating the data subheaders from the actual data to follow. The next two fields in the header are the User Defined Header Data Length and the User Defined Header Data. User defined data could be used to include registered tagged record extensions that provide additional information about the file. In this example, however, the length of the user defined header data is given as zero; therefore, the User Defined Header Data Field is omitted. The last field in the header are the Extended Header Data Length. The length of the extended header is given as zero; therefore, the Extended Header Data field is omitted, indicating that no controlled tagged record extensions are included in the file header.

6.1.2.2 Explanation of the image subheaders.

TABLE IV. Example of the first image subheader of the base image.

NITF IMAGE SUBHEADER FIELD	FORMAT	COMMENT
File Part Type (IM)	IM	2 characters
Image ID (IID)	0000000001	10 characters
Image Date & Time (IDATIM)	19960825203147	14 characters

TABLE IV-11. Example of the first image subheader of the base image - Continued.

NITF IMAGE SUBHEADER FIELD	FORMAT	COMMENT
Target ID (TGTID)		17 spaces
Image Title (ITITLE)	MAJOR TEST FACILITY AND HQ	26 characters followed by 54 spaces - 80 characters total
Image Security Classification (ISCLAS)	U	1 character
Image Codewords (ISCODE)		40 spaces
Image Control and Handling (ISCTLH)		40 spaces
Image Releasing Instructions (ISREL)		40 spaces
Image Classification Authority (ISCAUT)		20 spaces
Image Security Control Number (ISCTLN)		20 spaces
Image Security Downgrade (ISDWNG)		6 spaces
Encryption (ENCRYP)	0	Required default
Image Source (ISORCE)	Hand-held digital camera model XYZ.	35 characters followed by 7 spaces - 42 total characters
Number of Significant Rows in image (NROWS)	00001332	8 characters
Number of Significant Columns in image (NCOLS)	00002050	8 characters
Pixel Value Type (PVTYPE)	INT	3 characters - interpret pixel values as integers
Image Representation (IREP)	MONO	4 characters followed by 4 spaces - grayscale imagery
Image Class (ICAT)	VIS	3 characters followed by 5 spaces - visible imagery
Actual Bits-Per-Pixel Per Band (ABPP)	08	2 digits
Pixel Justification (PJUST)	R	1 character
Image Coordinate System (ICORDS)	N	1 character Space - indicates no geo location coordinates
Number of Image Comments (NICOM)	3	1 digit
* Image Comment 1 (ICOM1)	This is a comment on Major Test Facility base and associated inset. This file w	80 total characters

TABLE IV-II. Example of the first image subheader of the base image - Continued.

NITF IMAGE SUBHEADER FIELD	FORMAT	COMMENT
* Image Comment 2 (ICOM2)	as developed at Fort Huachuca, Arizona. It shows the Joint Interoperability Tes	80 total characters
* Image Comment 3 (ICOM3)	t Command Building and associated range areas.	464 characters followed by 346 spaces - 80 total characters
Image Compression (IC)	NC	2 characters - indicates no compression
Number of Bands (NBANDS)	1	1 digit
1st Band Representation (IREPBAND1)		2 spaces
1st Band Significance for Image Category (ISUBCAT1)		6 spaces
1st Band Image Filter Condition (IFC1)	N	1 character - required default value
1st Band Standard Image Filter Code (IMFLT1)		3 spaces - reserved
1st Band Number of LUTS (NLUTS1)	0	1 character
Image Sync Code (ISYNC)	0	1 digit
Image Mode (IMODE)	B	1 character - B required for 1 band
Number of Blocks per Row (NBPR)	0001	4 digits
Number of Blocks per Column (NBPC)	0001	4 digits
Number of pixels Per Block Horizontal (NPPBH)	2050	4 digits
Number of pixels Per Block Vertical (NPPBV)	1332	4 digits
Number of Bits per Pixel (NBPP)	08	2 digits
Display Level (IDLVL)	001	3 characters - minimum value makes this base image
Attachment Level (IALVL)	000	Required 3 digit value since minimum display level.
Location (ILOC)	0000000000	10 characters upper left pixel located at origin of common coordinate system
Image magnification (IMAG)	1.0	3 character followed by a space - 4 characters total

TABLE ~~IV~~**II**. ~~Example of the first image subheader of the base image~~ - Continued.

NITF IMAGE SUBHEADER FIELD	FORMAT	COMMENT
User Defined Image Data Length (UDIDL)	00000	5 digits
Extended Subheader Data Length (IXSHDL)	00000	5 digits

* According to the standard - this should look like a single contiguous comment of up to 3 x 80 characters.

6.1.2.2.1 Explanation of the first image subheader. There are two images in this sample file. The first image ~~or subimage~~ has Display Level 001. Its subheader is shown in table ~~IV~~**II**. It is an unclassified, single band, single block, gray scale image with 8 bits per pixel and does not have an associated LUT. There are three associated comments. It is visible imagery, does not have geo-location data and is stored as an uncompressed image. It is located at the origin of the common coordinate system within which all the displayable file components are located. It is 1332 rows by 2050 columns. Figure 15 illustrates the image printed at approximately three hundred pixels per inch.

TABLE ~~V~~**III**. ~~Example of the second image subheader of the first inset image~~.

NITF IMAGE SUBHEADER FIELD	FORMAT	COMMENT
File Part Type (IM)	IM	2 characters
Image ID (IID)	Missing ID	10 characters
Image Date & Time (IDATIM)	19960927011729	14 characters
Target ID (TGTID)		17 spaces
Image Title (ITITLE)	Zoomed Test Facility	18 characters followed by 62 spaces - 80 characters total
Image Security Classification (ISCLAS)	U	1 character
Image Codewords (ISCODE)		40 spaces
Image Control and Handling (ISCTLH)		40 spaces
Image Releasing Instructions (ISREL)		40 spaces
Image Classification Authority (ISCAUT)		20 spaces
Image Security Control Number (ISCTLN)		20 spaces
Image Security Downgrade (ISDWNG)		6 spaces - no downgrade event
Encryption (ENCRYP)	0	Required default
Image Source (ISORCE)	Cut of original image.	22 characters followed by 20 spaces - 42 characters total
Number of Significant Rows in image (NROWS)	00000224	8 characters

TABLE VIII. ~~Example of the second image subheader of the first inset image~~ - Continued.

NITF IMAGE SUBHEADER FIELD	FORMAT	COMMENT
Number of Significant Columns in image (NCOLS)	00000400	8 characters
Pixel value type (PVTYPE)	INT	3 characters - interpret pixel values as integers
Image Representation (IREP)	MONO	4 characters followed by 4 spaces - gray scale imagery
Image Class (ICAT)	VIS	3 characters followed by 5 spaces - visible imagery
Actual Bits-Per-Pixel Per Band (ABPP)	08	2 digits
Pixel Justification (PJUST)	R	1 character
Image Coordinate System (ICORDS)	N	1 character - Space - indicates no geo location coordinates
Number of Image Comments (NICOM)	0	1 digit
Image Compression (IC)	NC	2 characters - indicates uncompressed
Number of Bands (NBANDS)	1	1 digit
1st Band Representation (IREPBAND1)		2 spaces
1st Band Significance (ISUBCAT1)		6 spaces
1st Band Image Filter Condition (IFC1)	N	1 character - required default value
1st Band Standard Image Filter Code (IMFLT1)		3 spaces - reserved
1st Band Number of LUTS (NLUTS1)	0	1 character
Image Sync Code (ISYNC)	0	1 digit
Image Mode (IMODE)	B	1 character - B required for 1 band
Number of Blocks per Row (NBPR)	0001	4 digits
Number of Blocks per Column (NBPC)	0001	4 digits
Number of pixels Per Block Horizontal (NPPBH)	0400	4 digits
Number of pixels Per Block Vertical (NPPBV)	0224	4 digits
Number Bits Per Pixel (NBPP)	08	2 digits
Display Level (IDLVL)	002	3 digits
Attachment Level (IALVL)	001	3 digits

TABLE VIII. Example of the second image subheader of the first inset image - Continued.

NITF IMAGE SUBHEADER FIELD	FORMAT	COMMENT
Location (ILOC)	0057800142	10 characters, located at row 578 column 142 of base image
Image Magnification (IMAG)	1.0	3 characters followed by a space - 4 characters total
User Defined Image Data Length (UDIDL)	00000	5 digits
Extended Subheader Data Length (IXSHDL)	00000	5 digits

6.1.2.2.2 Explanation of the second image subheader. This image is the second image in the file. As is the first image, this image is an 8 bit visible, gray scale image. It is much smaller (400 columns x 224 rows) and is not compressed. Also, unlike the first image, it has no associated comment fields, indicated by the fact NICOM = 0. Since it is attached to the base image (IALVL = 001), the ILOC field reveals that this image is located with its upper left corner positioned at Row 578, Column 142 with respect to the upper left corner of the base image. Since it has a display level greater than that of the base image, it will obscure part of the base image when they are both displayed.

6.1.2.3 Explanation of the graphic subheaders.

TABLE XIV. Graphic subheader for the first graphic.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
File Part Type (SY)	SY	2
Graphic ID (SID)	0000000001	10
Graphic Name (SNAME)	HELO PAD RECTANGLE	18 characters followed by 2 spaces - total 20 characters
Graphic Security Classification (SSCLAS)	U	1 character
Graphic Codewords (SSCODE)		40 spaces
Graphic Control and Handling (SSCTLH)		40 spaces
Graphic Releasing Instructions (SSREL)		40 spaces
Graphic Classification Authority (SSCAUT)		20 spaces
Graphic Security Control Number (SSCTLN)		20 spaces
Graphic Security Downgrade (SSDWNG)		6 spaces
Encryption (ENCRYP)	0	Required default

TABLE ~~VII~~IV. Graphic subheader for the first graphic.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
Graphic Type (STYPE)	C	1 character - indicates CGM
(SRES1)	(TBD)	reserved 13 spaces
Display Level (SDLVL)	003	3 digits
Attachment Level (SALVL)	001	3 digits
Graphic Location (SLOC)	0039201110	10 characters
First Graphic Bound Location (SBND1)	0039201110	10 characters
Graphic Color (SCOLOR)	M	indicates CGM file contains no color components
Second Graphic Bound Location (SBND2)	0051001836	10 characters
(SRES2)	(TBD)	reserved 2 spaces
Extended Subheader Data Length (SXSHDL)	00000	5 digits

6.1.2.3.1 Explanation of the first graphic subheader. This graphic is a computer graphics metafile graphic (HELO PAD RECTANGLE). The graphic is attached to the base image, and its location is recorded in SLOC (row 392, column 1110) and is measured as an offset from the origin at the upper left corner of that image.

TABLE ~~VII~~IV. Graphic subheader for the second graphic.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
File Part Type (SY)	SY	2
Graphic ID (SID)	0000000002	10
Graphic Name (SNAME)	ARROW	5 characters followed by 15 spaces - total 20 characters
Graphic Security Classification (SSCLAS)	U	1 character
Graphic Codewords (SSCODE)		40 spaces
Graphic Control and Handling (SSCTLH)		40 spaces
Graphic Releasing Instructions (SSREL)		40 spaces
Graphic Classification Authority (SSCAUT)		20 spaces
Graphic Security Control Number (SSCTLN)		20 spaces

TABLE ~~VHIV~~. Graphic subheader for the second graphic - Continued.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
Graphic Security Downgrade (SSDWNG)		6 spaces
Encryption (ENCRYP)	0	Required default
Graphic Type (STYPE)	C	1 character - indicates CGM
(SRES1)	0000	Reserved 13 spaces
Display Level (SDLVL)	004	3 digits
Attachment Level (SALVL)	002	3 digits
Graphic Location (SLOC)	0000000285	10 characters relative to origin of second image
First Graphic Bound Location (SBND1)	-022500270	10 characters relative to origin of second image
Graphic Color (SCOLOR)	M	indicates CGM file contains no color components
Second Graphic Bound Location (SBND2)	0000000300	10 characters relative to origin of second image
(SRES2)	000	Reserved 2 spaces
Extended Subheader Data Length (SXSHDL)	00000	5 digits

6.1.2.3.2 Explanation of the second graphic subheader. The second graphic is also a CGM graphic. It is the arrow pointing to the test facility. It is attached to the subimage. Therefore, its location as recorded in SLOC is measured as an offset from the upper left corner of the subimage.

TABLE ~~VHIVI~~. Graphic subheader for the third graphic.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
File Part Type (SY)	SY	2
Graphic ID (SID)	0000000003	10
Graphic Name (SNAME)	HQ BUILDING	11 characters followed by 9 spaces - total 20 characters
Graphic Security Classification (SSCLAS)	U	1 character
Graphic Codewords (SSCODE)		40 spaces
Graphic Control and Handling (SSCTLH)		40 spaces
Graphic Releasing Instructions (SSREL)		40 spaces

TABLE ~~VIII~~**VI**. Graphic subheader for the third graphic - Continued.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
Graphic Classification Authority (SSCAUT)		20 spaces
Graphic Security Control Number (SSCTLN)		20 spaces
Graphic Security Downgrade (SSDWNG)		6 spaces
Encryption (ENCRYP)	0	Required default
Graphic Type (STYPE)	C	1 character - indicates CGM
(SRES1)		Reserved 13 spaces
Display Level (SDLVL)	005	3 digits
Attachment Level (SALVL)	001	3 digits
Graphic Location (SLOC)	0000000000	10 characters
First Graphic Bound Location (SBND1)	0062501710	10 characters
Graphic Color (SCOLOR)	M	indicates CGM file contains no color components
Second Graphic Bound Location (SBND2)	0070502010	10 characters
(SRES2)	000	Reserved 2 spaces
Extended Subheader Data Length (SXSHDL)	00000	5 digits

6.1.2.3.3 Explanation of the third graphic subheader. The third graphic is a CGM annotation (HQ Building). It is attached to the base image. Its location as recorded in SLOC is measured as an offset from the upper left corner of the base image, in this case SLOC is 0,0 and the offsetting for this graphic is actually done within the CGM construct itself.

TABLE ~~IX~~**VII**. Graphic subheader for the fourth graphic.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
File Part Type (SY)	SY	2
Graphic ID (SID)	0000000004	10
Graphic Name (SNAME)	MAJOR TEST FACILITY	19 characters followed by 1 spaces - total 20 characters
Graphic Security Classification (SSCLAS)	U	1 character
Graphic Codewords (SSCODE)		40 spaces

TABLE ~~IX~~**VII**. Graphic subheader for the fourth graphic - Continued.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
Graphic Control and Handling (SSCTLH)		40 spaces
Graphic Releasing Instructions (SSREL)		40 spaces
Graphic Classification Authority (SSCAUT)		20 spaces
Graphic Security Control Number (SSCTLN)		20 spaces
Graphic Security Downgrade (SSDWNG)		6 spaces
Encryption (ENCRYPT)	0	Required default
Graphic Type (STYPE)	C	1 character - indicates CGM
(SRES1)		Reserved 13 spaces
Display Level (SDLVL)	006	3 digits
Attachment Level (SALVL)	002	3 digits
Graphic Location (SLOC)	0008500415	10 characters relative to origin of second image
First Graphic Bound Location (SBND1)	0008500415	10 characters relative to origin of second image
Graphic Color (SCOLOR)	M	indicates CGM file contains no color components
Second Graphic Bound Location (SBND2)	0011500755	10 characters relative to origin of second image
(SRES2)	000	Reserved 2 spaces
Extended Subheader Data Length (SXSHDL)	00000	5 digits

6.1.2.3.4 Explanation of the fourth graphic subheader. The fourth graphic is a CGM graphic. It is the ~~Major Test Facility~~ **MAJOR TEST FACILITY** text. It is attached to the subimage. Therefore, its location as recorded in SLOC is measured as an offset from the upper left corner of the subimage.

TABLE ~~X~~**VIII**. Graphic subheader for the fifth graphic.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
File Part Type (SY)	SY	2
Graphic ID (SID)	0000000005	10

TABLE XVIII. Graphic subheader for the fifth graphic - Continued.

NITF GRAPHIC SUBHEADER FIELD	FORMAT	COMMENT
Graphic Name (SNAME)	COMMUNICATION ARROW	19 characters followed by 1 spaces - total 20 characters
Graphic Security Classification (SSCLAS)	U	1 character
Graphic Codewords (SSCODE)		40 spaces
Graphic Control and Handling (SSCTLH)		40 spaces
Graphic Releasing Instructions (SSREL)		40 spaces
Graphic Classification Authority (SSCAUT)		20 spaces
Graphic Security Control Number (SSCTLN)		20 spaces
Graphic Security Downgrade (SSDWNG)		6 spaces
Encryption (ENCRYP)	0	Required default
Graphic Type (STYPE)	C	1 character - indicates CGM
(SRES1)		Reserved 13 spaces
Display Level (SDLVL)	007	3 digits
Attachment Level (SALVL)	001	3 digits
Graphic Location (SLOC)	0047000040	10 characters
First Graphic Bound Location (SBND1)	0047000040	10 characters
Graphic Color (SCOLOR)	M	indicates CGM file contains no color components
Second Graphic Bound Location (SBND2)	0059000600	10 characters
(SRES2)	000	Reserved 2 spaces
Extended Subheader Data Length (SXSHDL)	00000	5 digits

6.1.2.3.45 **Explanation of the fifth graphic subheader.** The fifth graphic is a CGM graphic. It is the ~~Communications~~ **COMMUNICATIONS** NODE annotation with associated arrow. It is attached to the base image. Therefore, its location as recorded in SLOC is measured as an offset from the upper left corner of the base image.

6.1.2.4 Explanation of the text subheaders. There are 5 text documents included in the file. Other than the text data they contain, they differ only in matters such as title, date-time of creation, and ID. Therefore, only the first is discussed, since the subheaders of all the rest are essentially the same.

TABLE ~~XIX~~. Text subheader for the text document.

NITF TEXT SUBHEADER FIELD	FORMAT	COMMENT
File Part Type (TE)	TE	2 characters
Text ID (TEXTID)	0000000001	10 characters
Text Date & Time (TXTDT)	19960930224530	14 characters
Text Title (TXTITL)	First sample text file.	22 characters followed by 58 spaces - 80 total characters
Text Security Classification (TSCLAS)	U	1 character
Text Codewords (TSCODE)		40 spaces
Text Control and Handling (TSCTLH)		40 spaces
Text Releasing Instructions (TSREL)		40 spaces
Text Classification Authority (TSCAUT)		20 spaces
Text Security Control Number (TSCTLN)		20 spaces
Text Security Downgrade (TSDWNG)		6 spaces
Encryption (ENCRYP)	0	1 character - required default
Text Format (TXTFMT)	STA	3 characters
Extended Subheader Data Length (TXSHDL)	00000	5 digits

6.1.2.4.1 Explanation of the first text subheader. The first text document is unclassified and was created on September 30, 1996 at 22:45 hours. Its subheader is shown in Table ~~XIX~~.

6.2 Product considerations. The NITF provides a very flexible means to package imagery products. One of the main objectives of NITF is to provide increased interoperability among potentially disparate imagery systems. For the purposes of NITF, interoperability means the ability to exchange NITF formatted imagery products among NITF capable systems in a manner that is meaningful and useful to the end users. This places a significant burden on NITF read capable implementations to be able to interpret and use potentially any combination and permutation of NITF file format options that may be created by NITF file producers. Consequently, significant care should be taken when defining product specifications for NITF formatted imagery products. The objective of the following discussion is to describe several generalized product configurations that can be used as the basis for defining specific imagery products. These product configurations are typical of those successfully used within the imagery and mapping community to date.

6.2.1 NITF product configurations.

6.2.1.1 General. An imagery product may potentially be produced under one of the **following** concepts ~~described in the following paragraphs.~~

6.2.1.1.1 Single file, single base image. This is the most common use of the NITF format. In this product concept, the NITF file is produced with a focus on a single image, commonly called the 'base image'. All other segments and extended data within the file are focused on amplifying the information portrayed in the base image.

6.2.1.1.2 Single file, multiple images. In this product concept, the NITF file is produced containing multiple images, all of which have equal or similar significance to the value of the product. Other segments and extended data within the file are focused on amplifying the information portrayed in the image(s) to which they are associated.

6.2.1.1.3 Single file, no image. This type of product may only have graphic segments, or only text segments, or only extension segments, or any combination of these segments. The significance of the data within the file may pertain only to that file, or it may pertain to one or more files with which it is associated.

6.2.1.1.4 Multiple correlated files. For this product concept, the product is comprised of multiple NITF files that are interrelated as explicitly defined in the product specification.

6.2.1.2 Single file, single base image. For this type of product file, there is one image of central focus, the base image, placed on the Common Coordinate System (CCS) plane. Its first pixel may be located at the origin (0,0) of the CCS, or off-set from the CCS origin according to the row/column coordinate values placed in the location (LOC) field of the image subheader. Figure 1 56 provides a representative portrayal for the following discussion.

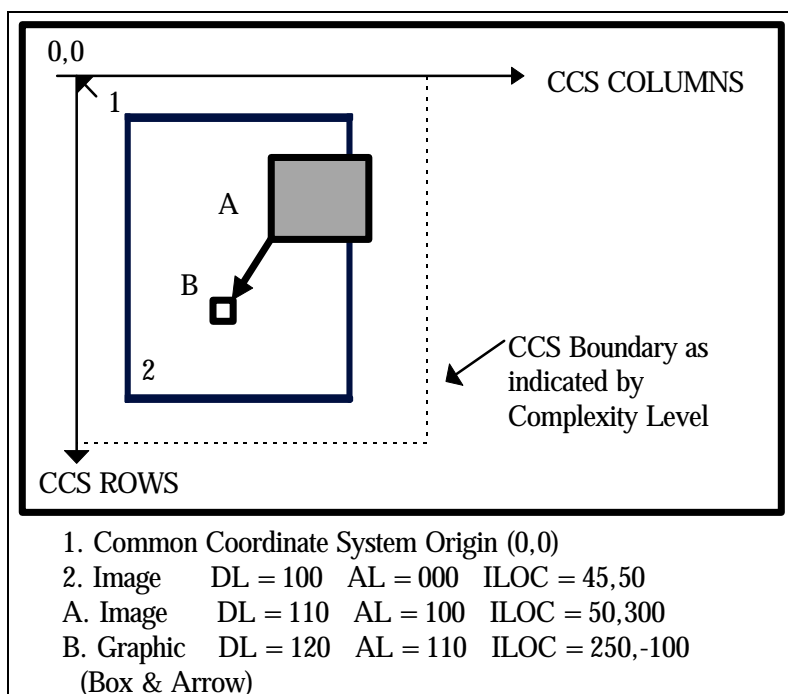


FIGURE 1 56. Single file, single base image.

6.2.1.2.1 Image segment overlays. Additional images, often called subimages or inset images, may be included as separate image segments in the file. The purpose of these images is to add information or clarity about the base image. Their placement in the CCS plane is controlled by the value of each segment's Attachment Level (AL) and Location (LOC) row/column value. When overlay images are attached to the base image, the LOC value represents a row/column off-set in the CCS from the location specified by the base image row/column LOC value. If the overlay image is unattached to any other segment (AL= 000), the overlay's LOC value is a row/column off-set from the CCS origin (0,0).

6.2.1.2.2 Graphic segment overlays. Graphic Segments are used to provide graphical (lines, polygons, ellipses, etc.) and textual annotation to the base image. The graphic representation is done using Computer Graphics Metafile (CGM). In a manner similar to image segment overlays, the placement of graphics in the CCS plane is controlled by the value of each segment's AL and LOC values. CGM has its own internal Cartesian coordinate space called "Virtual Display Coordinates (VDC)" that has its own defined origin (0,0) point. The row/column value in the graphic segment LOC field identifies the placement of the graphic's VDC origin point relative to the CCS origin when AL= 000, or relative to the segment LOC to which it is attached.

6.2.1.2.3 Non-destructive overlays. NITF image and graphic segment overlays are handled in a non-destructive manner. The overlays may be placed anywhere within the bounds of the CCS (defined for a specific NITF file by the Complexity level (Clevel)). They may be placed totally on the base image, partially on the base image, or entirely off of the base image. Any image or graphic segment can be placed on or under any other segment, fully or partially. The visibility of pixel values of overlapping segments is determined by the Display Level (DL) assigned to that segment. Each displayable segment (images and graphics) is assigned a DL (ranging from 001 - 999) that is unique within the file. At any CCS pixel location shared by more than one image or graphic, the visible pixel value is the one from the segment having the greatest DL value. If the user of a NITF file opts to move an overlay, or turn off the presentation of an overlay, the next greatest underlying pixel value(s) will then become visible. This approach allows for the non-destructible nature of NITF overlays as opposed to the 'burned in' approach where overlay pixel values are used to replace pixels values of the underlying image.

6.2.1.2.4 Text segments. Text segments allow inclusion in the NITF file of textual information related to the base image, perhaps a textual description of the activities portrayed in the image.

6.2.1.2.5 Extension data. The NITF file header and each standard data type sub-header have designated expandable fields to allow for the optional inclusion of extension data. The inclusion of extension data provides the ability to add data/information about the standard data type (metadata) that is not contained in the basic fields of the headers and subheaders. The additional data is contained within one or more NITF tagged record extensions that are placed in the appropriate field (user defined data field or extended data field) of the standard data type subheader for which the metadata applies. When tagged record extensions have application across multiple data types in the file, or otherwise apply to the entire NITF file in general, they are placed in the appropriate file header fields. Whereas general purpose NITF readers should always be able to portray image and graphic segments and act on standard header and subheader data, they may not always be able to act on product specific extension data. Upon receipt of a file that contains extension data, a NITF compliant system should at least ignore the extensions and properly interpret the other legal components of the NITF file. Exemplary use of tagged record extensions:

- a. Data about people, buildings, places, landmarks, equipment or other objects that may appear in the image.
- b. Data to allow correlation of information among multiple images and annotations within a NITF file.
- c. Data about the equipment settings used to obtain the digital image, xray, etc.
- d. Data to allow geopositioning of items in the imagery or measurement of distances of items in the imagery.

6.2.1.3 Single file, multiple images. For this type of product file, multiple images of equal or similar focus (multiple 'base' images) are placed within the Common Coordinate System (CCS) plane. Each image is located at an off-set from the CCS origin such that there is no overlap among the images. The Complexity Level of the file must be chosen such that the bounds of the CCS for the file are sufficient to contain the extent of all segments within the file. Figure 167 provides a representative portrayal for this product type.

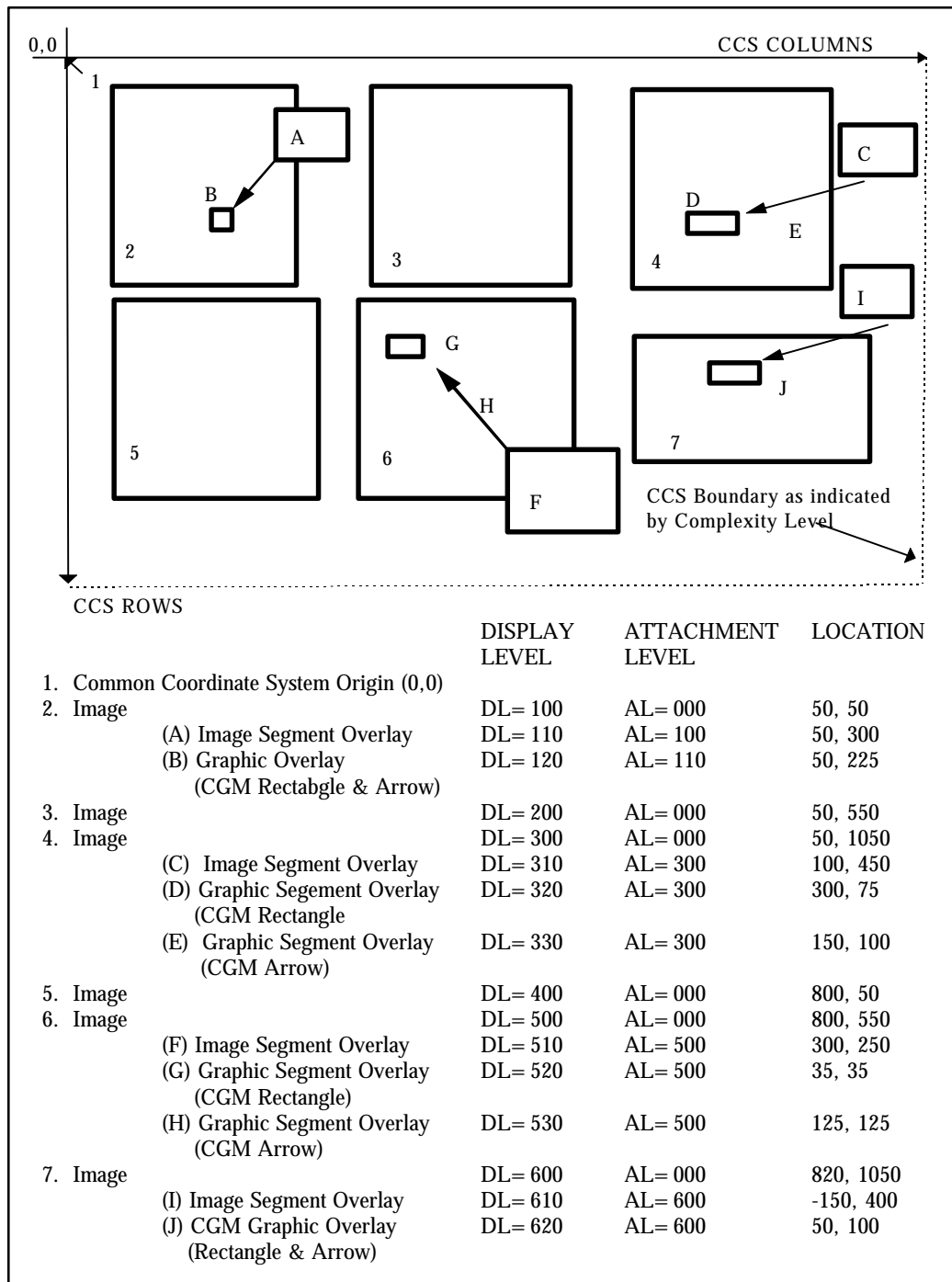


FIGURE 167. Single file, multiple images.

6.2.1.3.1 Overlays. Each image may be overlaid with additional image and graphic segments in the same fashion as described for the single file, single image case above. All overlays associated with a specific image should be attached to that specific image. Display Levels assigned to each image and graphic in the file must be unique within the file.

6.2.1.3.2 Text segments. Each text segment should be clearly marked as to whether it applies to the file as a whole, or if it is associated with specific images within the file.

6.2.1.3.3 Extension data. Tagged record extensions are placed in the file header extension fields when applicable to the file as a whole. Extensions specific to a segment are placed in that segment's subheader.

6.2.1.4 Single file, no image. An NITF single file product does not always contain an image. It could contain one or more graphic segments, one or more text segments, one or more extension segments, or any combination of these non-image segments. The file may be useful as a stand alone product, or it may be intended for use in conjunction with other NITF files. For example, the file could contain graphic overlays to be merged with or applied to another NITF file that was prepositioned or transmitted at an earlier time. Any general purpose NITF reader should at least be able to interpret and render the standard segments of no image NITF files on a stand alone basis.

6.2.1.5 Multiple correlated files. An imagery product may be comprised of multiple NITF files that are interrelated in a specified manner. This approach vastly increases the potential combination and permutation of options a general purpose NITF reader would need to support to maintain full interpret capability. Therefore, each NITF file in a multiple correlated file set must be structured such that a general purpose NITF reader can properly interpret and render the file as if it were a stand alone product. The correlation of multiple NITF files in a single product must be explicitly and unambiguously defined in a product specification. NITF readers can then be further categorized according to specific multiple file product specifications that are supported. Representative use of multiple correlated NITF files includes:

6.2.1.5.1 Stereo imagery. Some stereo image products are comprised of separate NITF files for the stereo components of each image scene.

6.2.1.5.2 Imagery mosaics. Some extremely large image and map products consist of multiple NITF files structured such that they can be pieced together in mosaic fashion by the interpret application as if the multiple files were a single larger image.

6.2.1.5.3 Reduced resolution data sets (Rsets). Rset products are comprised of multiple NITF files. One file contains a full resolution image and the other files contain the same image in a variety of lower resolutions.

6.2.1.5.4 Imagery and maps. Geopositioning products exist which consist of multiple separate NITF files containing interrelated maps, images, graphics, legends, product indices, and georeference data.

6.3 Sample NITF file structure. The following is an example of handling a file that has control tags with overflow. The file has a single image.

TABLE ~~XXX~~. Sample NITF file structure.

NITF HEADER																	IMAGE SUBHEADER		IMAGE DATA		DATAEXTENSION SUBHEADER			DATA EXTENSION								
	MAIN NITF HEADER														IMAGE SUBHEADER						DES SUBHEADER											
FIELD NAME	FHDR	CLEVEL	ETC	FL	HL	NUM I	LISH001	LI001	NUMS	NUMX	NUMT	NUMDES	LDSSH001	LD001	NUMRES	UDHDL	XHDL	IM	ETC	IMAG	UDIDL	IXSHDL	IXSOFL	IXSHD	IMAGE DATA	DE	DESTAG	ETC	DESOF LW	DESITEM DES SHL	DATA EXTENSION SEG	42000
BYTES	9	2		1	6	3	6	10	3	3	3	3	4	9	3	5	5	2		4	5	5	3	TAG DATA		2	25		6	34		
FIELD VALUE	NITF0210	06		0000805075764	000417	001	098442	0084934656	000	000	000	001	0249	000042000	000	000000	000000	IM		10	000000	980003	001	980000		DE	CONTROLLED EXTENSIONS		U D I D	00100000		
												TAG 1 (32,000 BYTES)			TAG 2 (27,000 BYTES)					TAG 3 (39,000 BYTES)								TAG 4 (42,000 BYTES)				

Note: Capacity of IXSHD is 99,999 bytes. You cannot split a tag, therefore the first 3 tags fit into the IXSHD and the 4th tag is overflowed into the Data Extension Area.

6.4 Subject term (key word) listing.

Annotation, Imagery
Blocked Image Mask
BWC
Compression Algorithm
Compression, Bi-Level
compression, Imagery
DCT, Discrete Cosine Transform
Facsimile Compression
File Format Graphics
Grayscale Scale Imagery
Group 3 Facsimile
Huffman Coding
Image
Image Compression
Image Dissemination
Image Transmission
Imagery, Bi-Level
Overlay
Picture
Quantization Matrices
Raster
Secondary Imagery Dissemination Systems
SIDS
Symbols
Tag
Transparent Pixel
Transparent Pixel Mask

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

APPENDIX A

NITF TABLES

A.1 SCOPE

This appendix is a mandatory part of this standard. The information contained herein is intended for compliance.

A.2 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

A.3 DEFINITIONS

The definitions in section 3 of this standard apply to this appendix.

A.4 DETAILED REQUIREMENTS

TABLE A-1. NITF file header.
(TYPE "R" = Required, "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
FHDR	<u>File Profile Name & Version</u> . A BCS character string of the form NITFNN.NN which indicates this file is formatted using version NN.NN of NITF. The valid values for this field is NITF01.10, 02.00, 02.10.	9	NITFNN.NN	R
CLEVEL	<u>Complexity Level</u> . This field shall contain the complexity level required to interpret fully all components of the file. Valid entries are integer assigned in accordance with certification complexity requirements established in JIEO Circular 9008.	2	BCS- AN , 01-99	R
STYPE	<u>Standard Type</u> . System Standard type or capability. This field is reserved for future use and shall be filled with BCS spaces (code 0x20). A BCS character string of the form BF01 which indicates that this file is formatted using ISO/IEC 12087-5. NITF02.10 is intended to be registered as a profile of ISO/ IEC 12087-5.	4	BF01	R
OSTAID	<u>Originating Station ID</u> . This field shall contain the identification code of the originating organization. It shall not be filled with spaces.	10	BCS-A (non-blank)	R
FDT	<u>File Date & Time</u> . This field shall contain the time (UTC) of the file's origination in the format CCYYMMDDhhmmss, where CC is the first two digits of the year (00-99), YY is the last two digits of the year (00-99), MM is the month (01-12), DD is the day (01-31), hh is the hour (00-23), mm is the minute (00-59), and ss is the second (00-59). UTC (Zulu) is assumed to be the time zone designator to express the time of day.	14	CCYYMMDDhhmmss	R
FTITLE	<u>File Title</u> . This field shall contain the title of the file or shall be filled with BCS spaces (code 0x20).	80	BCS-A (Default is spaces)	R

TABLE A-1. NITF file header - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
FSCLAS	<u>File Security Classification</u> . This field shall contain a valid value representing the classification level of the entire file. Valid values are T (= Top Secret), S (= Secret), C (= Confidential), R (= Restricted, U (= Unclassified).	1	T, S, C, R, or U	R
FSCODE	<u>File Codewords</u> . This field shall contain a valid indicator of the security compartments associated with the file. Typical values include one or more of the following separated by single BCS spaces (code 0x20): digraphs in accordance with table A-4 and complete code words or project numbers. The selection of a relevant set of codewords and project numbers is application specific. If this field is all BCS spaces (code 0x20), it shall imply that no codewords apply to the file.	40	BCS-A (Default is spaces)	R
FSCTLH	<u>File Control and Handling</u> . This field shall contain valid security control and handling instructions associated with the file. Typical values include one or more of the following separated by single BCS spaces (code 0x20) within the field: digraphs in accordance with table A-4 and complete codewords or project numbers. The selection of a relevant set of codewords and project numbers is application specific. If this field is all BCS spaces (code 0x20), it shall imply that no control and handling instructions apply to the file.	40	BCS-A (Default is spaces)	R
FSREL	<u>File Releasing Instructions</u> . This field shall contain a valid list of countries and/or groups of countries to which the file is authorized for release. Valid items in the list are one or more of the following separated by single BCS spaces (code 0x20) within the field: country codes and groupings that are digraphs in accordance with table A-4. If this field is all BCS spaces (code 0x20), it shall imply that no file release instructions apply.	40	BCS-A (Default is spaces)	R
FSCAUT	<u>File Classification Authority</u> . This field shall contain a valid identity code of the classification authority for the file. The code shall be in accordance with the regulations governing the appropriate security channel(s). If this field is all BCS spaces (code 0x20), it shall imply that no file classification authority applies.	20	BCS-A (Default is spaces)	R
FSCTLN	<u>File Security Control Number</u> . This field shall contain a valid security control number associated with the file. The format of the security control number shall be in accordance with the regulations governing the appropriate security channel(s). If this field is all BCS spaces (code 0x20), it shall imply that no file security control number applies.	20	BCS-A (Default is spaces)	R

TABLE A-1. NITF file header - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
FSDWNG	<u>File Security Downgrade</u> . This field shall contain a valid indicator that designates the date on which a declassification or downgrading action is to take place. The valid values are (1) the calendar date in the format YYMMDD or (2) the code "999999" when the originating agency's determination is required (OARD). If this field is all BCS spaces (code 0x20), it shall to imply that no file security downgrade condition applies.	6	BCS-A (Default is spaces)	R
FSCOP	<u>File Copy Number</u> . This field shall contain the copy number of the file. If this field is all BCS zeroes (code 0x30), it shall imply that there is no tracking of numbered file copies.	5	BCS-N integer 00000-99999 (Default is 00000)	R
FSCPYS	<u>File Number of Copies</u> . This field shall contain the total number of copies of the file. If this field is all BCS zeroes (code 0x30), it shall imply that there is no tracking of numbered file copies.	5	BCS-N integer 00000-99999 (Default is 00000)	R
ENCRYP	<u>Encryption</u> . This field shall contain the value 0 until such time as this specification is updated to define the use of other values.	1	0 = Not Encrypted	R
ONAME	<u>Originator's Name</u> . This field shall contain a valid name for the operator who originated the file. If the field is all BCS spaces (code 0x20), it shall mean that no operator is assigned responsibility for origination.	27	BCS-A (Default is spaces)	R
OPHONE	<u>Originator's Phone Number</u> . This field shall contain a valid phone number for the operator who originated the file. If the field is all BCS spaces (code 0x20), it shall mean that no phone number is available for the operator assigned responsibility for origination.	18	BCS-A (Default is spaces)	R
FL	<u>File Length</u> . This field shall contain the length in bytes of the entire file including all headers, subheaders, and data.	12	BCS-N integer 000000000388- 999999999999	R
HL	<u>NITF File Header Length</u> . This field shall contain a valid length in bytes of the NITF file header.	6	BCS-N integer 000388-999999	R
NUMI	<u>Number of Images</u> . This field shall contain the number of separate image items included in the file. This field shall be 0 if and only if no images are included in the file.	3	BCS-N integer 000-999	R
NOTE: LISHnnn and LInnn fields repeat in pairs such that LISH001, LI01; LISH002, LI002; .....LISHnnn,LInnn.				
LISHnnn	<u>Length of nth Image Subheader</u> . This field shall contain a valid length in bytes for the nnn th image subheader, where nnn is the number of the image counting from the first image (nnn= 001) in order of the images' appearance in the file. This field shall occur as many times as specified in the NUMI field. This field is conditional and shall be omitted if the NUMI field contains 0.	6	BCS-N integer 000439-999999	C

TABLE A-1. NITF file header - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
LInnn	<u>Length of nth Image.</u> This field shall contain a valid length in bytes of the nnn th image, where nnn is the image number of the image counting from the first image (nnn= 001) in order of the images' appearance in the file. If the image is compressed, the length after compression shall be used. This field shall occur as many times as specified in the NUMI field. This field is conditional and shall be omitted if the NUMI field contains 0.	10	BCS-N integer 0000000001- 9999999999	C
NUMS	<u>Number of Graphics.</u> This field shall contain the number of separate graphic items included in the file. This field shall be 0 if and only if no graphics are included in the file.	3	BCS-N integer 000-999	R
NOTE: LSSHnnn and LSnnn fields repeat in pairs such that LSSH001, LS00; LSSH001, LS002; .....LSSHnnn,LSnnn.				
LSSHnnn	<u>Length of nth Graphic Subheader.</u> This field shall contain a valid length in bytes for the nnn th graphic subheader, where nnn is the number of the graphics counting from the first graphic (nnn= 0001) in the order of the graphics' appearance in the file. This field shall occur as many times as specified in the NUMS field. This field is conditional and shall be omitted if the NUMS contains 0.	4	BCS-N integer 0258-9999	C
LSnnn	<u>Length of nth Graphic.</u> This field shall contain a valid length in bytes of the nnn th graphic, where nnn is the number of the graphic, counting from the first graphic (nnn= 001) in the order of the graphics' appearance in the file. This field shall occur as many times as specified in the NUMS field. This field is conditional and shall be omitted if NUMS field contains 0.	6	BCS-N integer 000001-999999	C
NUMX	<u>Reserved for Future Use.</u> This field is reserved for future use and shall be filled with BCS zeroes (code 0x30).	3	000	R
NUMT	<u>Number of Text Files.</u> This field shall contain the number of separate text items included in the file. This field shall be 0 if and only if no text items are included in the file.	3	BCS-N integer 000-999	R
NOTE: LTSHnnn and LTnnn fields repeat in pairs such that LTSH001, LT00; LTSH001, LT002; .....LTSHnnn,LTnnn.				
LTSHnnn	<u>Length of nth text subheader.</u> This field shall contain a valid length in bytes for the nnn th text item subheader, where nnn is the number of the text item, counting from the first text item (nnn= 001) in the order of the text items' appearance in the file. This field shall occur as many times as specified in the NUMT field. This field is conditional and shall be omitted if the NUMT field contains 0.	4	BCS-N integer 0282-9999	C

TABLE A-1. NITF file header - Continued.

FIELD	NAME	SIZE	VALUE	TYPE
LTnnn	<u>Length of nth Text File.</u> This field shall contain a valid length in bytes of the nnn th text item, where nnn is the number of the text item, counting from the first text item (nnn= 001) in the order of the text items' appearance in the file. This field shall occur as many times as specified in the NUMT field. This field is conditional and shall be omitted if the NUMT field contains 0.	5	BCS-N integer 00001-99999	C
NUMDES	<u>Number of Data Extension Segments.</u> This field shall contain the number of separate data extension segments included in the file. This field shall be 0 if and only if no data extension segments are included in the file.	3	BCS-N integer 000-999	R
NOTE: LDSHnnn and LDnnn fields repeat in pairs such that LDSH001, LD001; LDSH001, LD002; .....LDSHnnn,LDnnn.				
LDSHnnn	<u>Length of nth Data Extension Segment Subheader.</u> This field shall contain a valid length in bytes for the nnn th data extension segment subheader, where nnn is the number of the data extension segment counting from the first data extension segment (nnn= 001) in order of the data extension segment's appearance in the file. This field shall occur as many times as are specified in the NUMDES field. This field is conditional and shall be omitted if the NUMDES field contains 0.	4	BCS-N integer 0201-9999	C
LDnnn	<u>Length of nth Data Extension Segment Data.</u> This field shall contain a valid length in bytes of the data in the nnn th data extension segment, where nnn is the number of the data extension segment counting from the first data extension segment (nnn= 001) in order of the data extension segment's appearance in the file. This field shall occur as many times as are specified in the NUMDES field. This field is conditional and shall be omitted if the NUMDES fields contains 0.	9	BCS-N integer 000000001-999999999	C
NUMRES	<u>Number of Reserved Extension Segments.</u> This field shall contain the number of separate reserved extension segments included in the file. This field shall be 0 if and only if no reserved extension segments are included in the file.	3	BCS-N integer 000-999	R
NOTE: LRESHnnn and LREnnn fields repeat in pairs such that LRESH001, LRE001; LRESH001, LRE002; .....LRESHnnn,LREnnn.				
LRESHnnn	<u>Length of nth Reserved Extension Segment Subheader.</u> This field shall contain a valid length in bytes for the nnn th reserved extension segment subheader, where nnn is the number of the reserved extension segment counting from the first reserved extension segment (nnn= 001) in order for the reserved extension segment's appearance in the file. This field shall occur as many times as are specified in the NUMRES field. This field is conditional and shall be omitted if the NUMRES field contains 0.	4	BCS-N integer 0001-9999	C

TABLE A-1. NITF file header - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
LREnnn	<u>Length of nth Reserved Extension Segment Data Field.</u> This field shall contain a valid length in bytes for the nnn th reserved extension segment subheader, where nnn is the number of the reserved extension segment counting from the first reserved extension segment (nnn= 001) in order of the reserved extension segment's appearance in the file. This field shall occur as many times as are specified in the NUMRES field. This field is conditional and shall be omitted if the NUMRES field contains 0.	7	BCS-N integer 0000001-9999999	C
UDHDL	<u>User Defined Header Data Length.</u> This field shall contain the length in bytes of the entire UDHD field plus 3 bytes (length of UDHOFL field). The length is three bytes plus the sum of the lengths of all the registered tagged record extensions (see paragraph 5.8.1.1) appearing in the UDHD field. A value of 0 shall mean that no registered tagged record extensions are included in the file. If a registered tagged record extension exists, the field shall contain the sum of the length of all the registered tagged record extensions (see paragraph 5.7.1.1) appearing in the UDHD field plus 3 bytes (length of UDHOFL field). If a registered tagged record extension is too long to fit in the UDHD field, it may be put in a data extension segment (see paragraph 5.8.7.1.3.1).	5	BCS-N integer 00000 or 000003 -99999	R
UDHOFL	<u>User Defined Header Overflow.</u> This field shall contain BCS zeroes (code 0x30) if the tagged record extensions in UDHD do not overflow into a DES, or shall contain the sequence number of the DES into which they do overflow. This field shall be omitted if the field UDHDL contains 0.	3	BCS-N integer 000-999	C
UDHD	<u>User Defined Header Data.</u> If present, this field shall contain user defined registered tagged record extension data (see paragraph 5.8.1.1). The length of this field shall be the length specified by the field UDHDL minus 3 bytes. Registered tagged record extensions shall appear one after the other with no intervening bytes. The first byte of this field shall be the first byte of the first registered tagged record extension appearing in the field. The last byte of this field shall be the last byte of the last registered tagged record extension to appear in the field. This field shall be omitted if the field UDHDL contains 0.	*1	User defined	C

TABLE A-1. NITF file header - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
XHDL	Extended Header Data Length. This field shall contain the length in bytes of the entire XHD field plus 3 bytes (length of XHDLOFL field). The length is three plus the sum of the lengths of all the controlled tagged record extensions (see paragraph 5.8.1.2) appearing in the XHD field, since they are not separated from one another. A value of 0 shall mean that no controlled tagged record extensions are included in the NITF header. If a controlled tagged record extension exists, the field shall contain the sum of the length of all the controlled tagged record extensions (see paragraph 5.7.1.2) appearing in the XHD field plus 3 bytes (length of XHDLOFL field). If a controlled tagged record extension is too long to fit in the XHD field, it may be put in a data extension segment (see paragraph 5.8.7.1.3.1).	5	BCS-N integer 00000 or 000003-99999	R
XHDLOFL	Extended Header Data Overflow. This field shall contain BCS zeroes (code 0x30) if the tagged record extensions in XHD do not overflow into a DES, or shall contain the sequence number of the DES into which they do overflow. This field shall be omitted if the field XHD contains 0.	3	BCS-N integer 000-999	C
XHD	Extended Header Data. If present, this field shall contain controlled tagged record extensions (see paragraph 5.8.1.2) approved and under configuration management of the ISMC. The length of this field shall be the length specified by the field XHDL minus 3 bytes. Controlled tagged record extensions shall appear one after the other with no intervening bytes. The first byte of this field shall be the first byte of the first controlled tagged record extension appearing in the field. The last byte of this field shall be the last controlled tagged record extension to appear in the field. This field shall be omitted if the field XHDL contains 0.	**1	Controlled Tagged Record Extensions	C

*1 As specified in UDHDL value minus 3 bytes

**1 As specified in XHDL value minus 3 bytes

TABLE A-2. NITF image item category and representation.

IMAGE CATEGORY (ICAT)	DEFINITION	IMAGE REPRESENTATION (IREP)	STANDARD EXTENSION
VIS SL TI FL RD EO OP HR HS CP BP SAR SARIQ IR MS FP MRI XRAY CAT	Visible Imagery Side-Looking Radar Thermal Infrared Forward Looking Infrared Radar Electro-optical Optical High Resolution Radar Hyperspectral Color Frame Photography Black/White Frame Photography Synthetic Aperture Radar SAR Radio Hologram Infrared Multispectral Fingerprints Magnetic Resonance Imagery X-rays CAT Scans	MONO, RGB, RGB/LUT, YCbCr601, MULTI	If georeferenced, presence of spatial location and positional accuracy is mandatory. Source description may be transmitted.
MAP	Raster Maps	MONO, RGB, RGB/LUT, YCbCr601	If georeferenced, presence of spatial location and positional accuracy is mandatory. Source description may be transmitted.
LEG	Legends	MONO, RGB, RGB/LUT, YCbCr601	none
PAT	Color Patch	RGB, YCbCr601	none
DTEM	Matrix Data (elevations)	1D, ND	Presence of spatial location and positional accuracy is mandatory. Source description may be transmitted.
MATR	Matrix Data (other)	1D, ND	Presence of spatial location and positional accuracy is mandatory. Source description may be transmitted.
LOCG	Location Grid	2D	none

TABLE A-3. NITF image subheader.
 TYPE "R" = Required, "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
IM	<u>File Part Type.</u> This field shall contain the characters "IM" to identify the subheader as an image subheader..	2	IM	R
IID	<u>Image ID.</u> This field shall contain a valid alphanumeric identification code associated with the image. The valid codes are determined by the application.	10	BCS non-blank User defined	R
IDATIM	<u>Image Date & Time.</u> This field shall contain the time (UTC) of the files origination in the format CCYYMMDDhhmmss, where CC is the first two digits of the year (00-99), YY is the last two digits of the year (00-99), MM is the month (01-12), DD is the day (0-31), hh is the hour (00-23), mm is the minute (00-59), ss is the second (00-59). UTC (Zulu) is assumed to be the time zone designator to express the time of day.	14	CCYYMMDDhhmmss	R
TGTID	<u>Target ID.</u> This field shall contain the identification of the primary target in the format, BBBBBBBBBBBFFFFCC, consisting of ten characters of BE (Basic Encyclopedia) identifier, followed by five characters of functional category code, followed by the two character country code as specified in TBD.	17	BCS-A (Default is spaces)	R
ITITLE	<u>Image Title.</u> This field shall contain the title of the image.	80	BCS-A (Default is spaces)	R
ISCLAS	<u>Image Security Classification.</u> This field shall contain a valid value representing the classification level of the image. Valid values are: T (= Top Secret), S (= Secret), C (= Confidential), R (= Restricted), U (= Unclassified).	1	T, S, C, R, or U	R
ISCODE	<u>Image Codewords.</u> This field shall contain a valid indicator of the security compartments associated with the image. Valid values are one or more of the following separated by single BCS spaces (code 0x20) within the field: digraphs in accordance with table A-4, and complete codewords or project numbers. The selection of a relevant set of codewords and project numbers is specific to the application. If this field is all BCS spaces (code 0x20), it shall imply that no codewords apply to the image.	40	BCS-A (Default is spaces)	R
ISCTLH	<u>Image Control and Handling.</u> This field shall contain valid security handling instructions associated with the image. Valid values are one or more of the following separated by single BCS spaces (code 0x20) within the field: digraphs in accordance with table A-4, complete codewords and abbreviations of more than two characters, and phrases only if the words within the phrase are separated by hyphens. The selection of a relevant set of security handling instructions is implementation specific. If this field is all BCS spaces (code 0x20), it shall imply that no image control and handling instructions apply.	40	BCS-A (Default is spaces)	R

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
ISREL	<u>Image Releasing Instructions</u> . This field shall contain a valid list of countries and/or groups of countries to which the image is authorized for release. Valid items in the list are one or more of the following separated by single BCS spaces (code 0x20) within the field: country codes and groupings that are digraphs in accordance with table A-4. If this field is all BCS spaces (code 0x20), it shall imply that no image release instructions apply.	40	BCS-A (Default is spaces)	R
ISCAUT	<u>Image Classification Authority</u> . This field shall contain a valid identity code of the classification authority for the image. The code shall be in accordance with the regulations governing the appropriate security channel(s). If this field is all BCS spaces (code 0x20), it shall imply that no image classification authority applies.	20	BCS-A (Default is spaces)	R
ISCTLN	<u>Image Security Control Number</u> . This field shall contain a valid security control number associated with the image. The format of the security control number shall be in accordance with the regulations governing the appropriate security channel(s). If this field is all BCS spaces (code 0x20), it shall imply that no image security control number applies.	20	BCS-A (Default is spaces)	R
ISDWNG	<u>Image Security Downgrade</u> . This field shall contain a valid indicator that designates the date at which a declassification or downgrading action is to take place. The valid values are (1) the calendar date in the format YYMMDD and (2) the code "999999" when the originating agency's determination is required (OADR). If this field is all BCS spaces, it shall imply that no image security downgrade condition applies.	6	BCS-A (Default is spaces)	R
ENCRYP	<u>Encryption</u> . This field shall contain the value BCS zero (code 0x30) until such time as this specification is updated to define the use of other values.	1	0= Not Encrypted	R
ISORCE	<u>Image Source</u> . This field shall contain a description of the source of the image. If the source of the data is classified, then the description shall be preceded by the classification, including codeword(s) (table A-4). If this field is all BCS spaces (code 0x20), it shall imply that no image source data applies.	42	BCS-A (Default is spaces)	R
NROWS	<u>Number of Significant Rows in Image</u> . This field shall contain the total number of rows of significant pixels in the image. When $NPPBV * NBPC > NROWS$, the remaining last rows ($NPPBV * NBPC - NROWS$) shall contain fill data (that is, only the rows indexed 0 through $NROWS - 1$ of the image contain "significant" data). The pixel fill values are determined by the application.	8	BCS-N integer 00000001-99999999	R

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
NCOLS	<u>Number of Significant Columns in Image</u> . This field shall contain the total number of columns of significant pixels in the image. When $NPPBH * NBPR > NCOLS$, the remaining last pixels of each column ($NPPBH * NBPR - NCOLS$) shall contain fill data (that is, only the columns indexed 0 through $NCOLS - 1$ of the image contain "significant" data). The pixel fill values are determined by the application.	8	BCS-N integer 00000001-99999999	R
PVTYPE	<u>Pixel Value Type</u> . This field shall contain an indicator of the type of computer representation used for the value for each pixel for each band in the image. Valid entries are INT for interger, B for bi-level, SI for 2's complement signed integer, R for real, and C for complex. The data bits of INT and SI values shall appear in the file in order of significance, beginning with the most significant bit (MSB) and ending with the least significant bit (LSB). INT and SI data types shall be limited to 16 bits. R values shall be represented according to IEEE 32-bit floating point representation. C values shall be represented with the Real and Imaginary parts, each represented in IEEE 32-bit floating point representation. C values shall be represented with the Real and Imaginary parts, each represented in IEEE 32-bit floating point representation and appearing in adjacent four-byte blocks, first Real, then Imaginary. B (bi-level) pixel values shall be represented as single bits with value 1 or 0.	3	INT, B, SI, R, C	R
IREP	<u>Image Representation</u> . This field shall contain a valid indicator for the general kind of image represented by the data. Valid representation indicators are MONO for monochrome; RGB for red, green, or blue true color, RGB/LUT for mapped color; 1D for monoband matrix/grid data; 2D for two dimensional data in support of location grids; ND for multiband matrix/grid data; and MULTI for multiband imagery. In addition, compressed imagery can have this field set to YCbCr601 when compressed in the CCIR 601 color space using JPEG (field IC= C3). This field should be used in conjunction with the ICAT, ISUBCATnn, and IREPBANDnn fields to interpret the significance of each band in the image.	8	MONO, RGB, RGB/LUT, 1D, 2D, ND, MULTI, YCbCr601	R

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
ICAT	<u>Image Category</u> . This field shall contain a valid indicator of the specific category of image, raster or grid data. Valid categories are include VIS for visible imagery, SL for side-looking radar, TI for thermal infrared, FL for forward looking infrared, RD for radar, EO for electro-optical, OP for optical, HR for high resolution radar, HS for hyperspectral, CP for color frame photography, BP for black/white frame photography, SAR for synthetic aperture radar, SARIQ for SAR radio hologram, IR for infrared, MS for multispectral, FP for fingerprints, MRI for magnetic resonance imagery, XRAY for x-rays, and CAT for CAT scans. Valid categories for geographic products or georeference support data are MAP for raster maps, PAT for color patch, LEG for legends, DTEM for elevation models, MATR for other types of matrix data, and LOCG for location grids. This field should be used in conjunction with the IREP, ISUBCATnn, and IREPBANDnn fields to interpret the significance of each band in the image.	8	VIS, SL, TI, FL, RD, EO, OP, HR, HS, CP, BP, SAR, SARIQ, IR, MS, FP, MRI, XRAY, CAT, MAP, PAT, LEG, DTEM, MATR, LOCG (Default is VIS)	R
ABPP	<u>Actual Bits-Per-Pixel Per Band</u> . This field shall contain the number of “significant bits” for the value in each band of each pixel without compression. Even when the image is compressed, ABPP contains the number of significant bits per pixel that were present in the image before compression. This field shall be less than or equal to Number of Bits Per Pixel (field NBPP). The number of adjacent bits within each NBPP is used to represent the value. These “representation bits” shall be left justified or right justified within the NBPP bits, according to the value in the PJUST field. For example, if 11-bit pixels are stored in 16 bits, their field shall contain 11 and NBPP shall contain 16. The default number of “significant bits” to be used (if this field is all 0s) is the value contained in NBPP.	2	BCS-N integer 01-24	R
PJUST	<u>Pixel Justification</u> . When ABPP is not equal to NBPP, this field indicates whether the significant bits are left justified (L) or right justified (R). Nonsignificant bits in each pixel shall contain the value 0. Any value other than L or R in this field shall indicate right justified.	1	L or R (Default is R)	R

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
ICORDS	<u>Image Coordinate System</u> . This field shall contain a valid code indicating the type of coordinate system used for providing an approximate location of the image in the Image Geographic Location field (IGEOL). The valid values for this field are : U= UTM expressed in Military Grid Reference System (MGRS) form, N= UTM (Northern hemisphere), S= UTM (Southern hemisphere), and G= Geographic. (Choice between N and S is based on hemisphere of northernmost point.) The default Geodetic reference system is WGS84. If no coordinate system is identified, the space (BCS 0x20) shall be used.	1	U, G, N, S or space	R
IGEOL	<u>Image Geographic Location</u> . This field shall contain an approximate geographic location, in terms of corner locations, of the image in the coordinate system specified in the ICORDS field. The locations of the four corners of the (significant) image data shall be given in image coordinate order: (0,0), (0, MaxCol), (MaxRow, MaxCol), (MaxRow, 0). MaxCol and MaxRow shall be determined from the values contained, respectively, in NCOLS and NROWS as MaxCol = NCOLS -1 and MaxRow = NROWS -1. Valid corner locations in geographic coordinates shall be expressed as latitude and longitude. The format ddmmsX represents degrees, minutes, and seconds of latitude with X = N or S for north or south, and dddmssY represents degrees, minutes, and seconds of longitude with Y = E or W for east or west, respectively. For the UTM coordinate system, coordintes shall be expressed either in plain UTM coordinates or using MGRS. Plain UTM coordinates use the format ZZzz eeeeennnnnn where “ ZZzz ” represents the UTM zone number, and “eeeeee,” “nnnnnn” represent Easting and Northing. UTM expressed in MGRS use format zzXYZBJK eeeeennnnn where “ zzXYZBJK ” represents the zone, band and 100 km ² area within the zone and “eeeeee,” “nnnnn” represent residuals of Easting and Northing. With the exception of UTM, there is no implied accuracy associated with the data in this field. Specific accuracies for coordinate sysems are provided in extensions to NITF.	60	ddmmsXdddmmssY (four times) or zzXYZeeeeennnnn or zzBJK eeeeennnnn (four times) or Zzz eeeeennnnnn (four times)	C
NICOM	<u>Number of Image Comments</u> . This field shall contain the valid number of 80 character blocks (ICOMn) that follow to be used as free text image comments.	1	BCS-N integer 0-9	R

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
ICOMn	<u>Image Comment n.</u> The field (ICOM1 through ICOMn), when present, shall contain free-form BCS-A text. They are intended for use as a single comment block and should be used that way. This field shall contain the n th free text image comment, where n is defined as follows: $1 \leq n \leq \text{NICOM}$. If the image comment is classified, it shall be preceded by the classification, including codeword(s). This field shall be omitted if the value in the NICOM field is 0.	80	BCS-A User defined	C
IC	<u>Image Compression.</u> This field shall contain a valid code indicating the form of compression used in representing the image data. Valid values for this field are, C1 to mean bi-level, C3 to mean JPEG, C4 to mean Vector Quantization, C5 to mean lossless JPEG, and NC to mean the image is not compressed. Also valid are M1, M3, M4, and M5 for compressed images, and NM for uncompressed images indicating an image that contains a block mask and/or a transparent pixel mask. The format of a mask image is identical to the format of its corresponding non-masked image except for the presence of an Image Data Mask at the beginning of the image data area. The format of the Image Data Mask is described in paragraph 5.4.3.2 and is shown in table A-3(A). The definitions of the compression schemes associated with codes C1/M1, C3/M3, C4/M4, and C4/M5 are given, respectively, in CCITT Recommendation ITU-T T-4, AMD2 08/95 , ISO/ IEC 10918-1, ISO/ IEC 10918-3, MIL-STD-188-198, and MIL-STD-188-199.	2	NC, NM, C1, C3, C4, C5, M1, M3, M4, M5	R

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
COMRAT	<p><u>Compression Rate Code</u>. If the Image Compression (IC) field contains, C1, C3, C4, C5, M1, M3, M4, or M5 this field shall be present and contain a code indicating the compression rate for the image. If the value in IC is C1 or M1, the valid codes are 1D, 2DS, and 2DH, where:</p> <p>1D means One-dimensional Coding 2DS means Two-dimensional Coding Standard Vertical Resolution (K= 2) 2DH means Two-dimensional Coding High Vertical Resolution (K= 4)</p> <p>Explanation of these codes can be found in CCITT Recommendation ITU-T T-4, AMD2 08/95.</p> <p>If the value in IC is C3 or M3, this field is used to identify the default embedded quantization table(s) used by the JPEG compression algorithm. when the tables are not embedded in the compressed data stream. In this case, the format of this field is XX.Y where XX is the image data type (00= general purpose, 01 through 99 are reserved), and Y represents the quality level 1 through 5. When the JPEG quantization tables are embedded in the data stream, the value of this field shall be 00.0.</p> <p>Explanation of these codes embedded tables can be found in MIL-STD-188-198.</p> <p>If the value in IC is C4 or M4, this field shall contain a value given in the form nn.n representing the number of bits-per-pixel for the compressed image. Explanation of the compression rate for vector quantization can be found in MIL-STD-188-199.</p> <p>If the value in IC is C5 or M5, this field shall contain a value given by TBD ISO/IEC 10918-3. This field is omitted if the value in IC is NC or NM.</p>	4	BCS-A See description for constraints	C
NBANDS	<p><u>Number of Bands</u>. This field shall contain the number of data bands within the specified image. This field and the IREP field are interrelated and independent of the IMODE field. The corresponding values for (IREP, NBANDS) are (MONO, 1); (RGB, 3); (RGB/LUT, 1); (YCbCr601, 3); (MULTI, 2-9); and 0 for multi-spectral images with greater than 9 bands.</p>	1	BCS-N integer 0-9 See description for details	R
XBANDS	<p><u>Number of Multi-Spectral Bands</u>. When NBANDS contains the value 0, this field shall contain the number of bands comprising the multi-spectral image.</p>	5	BCS-N integer 00010-99999	C
.....				
NOTE: The fields IREPBANDnn through LUTDnnm repeat the number of times indicated in the NBANDS field or the XBANDS field.				

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
IREPBAND _{nn}	<u>nnth Band Representation</u> . When NBANDS contains the value 1, this field shall contain all spaces. In all other cases, this field shall contain a valid indicator of the interpretation of the nn th band. The band number is a positive integer when IREP contains MULTI. In all other cases, the use of this field is user defined. If the IREP field contains the value “2D,” this field shall contain “LX” or “LY.” However, its purpose is to provide the significance of the nn th band of the image with regard to the general image type as recorded in IREP. The significance of each band in the image can be derived from the combination of the IREP, IREPBAND _{nn} , ICAT, and ISUBCAT _{nn} fields.	2	BCS-A, spaces, R, G, B, Y, Cb, Cr, 01-09, LX, LY (TBA for location grids)	R
ISUBCAT _{nn}	<u>nnth Band Subcategory</u> . (This field is repeated for each band). The use of this field is user-defined except for the location grids and matrix data. Its purpose is to provide the significance of the nn th band of the image with regard to the specific category (ICAT) of the overall image. An example would be the wave length of IR imagery. For location grids, the number of bands is strictly equal to 2, consequently, there are only 2 fields ISUBCAT1 and ISUBCAT2. Standard values of these fields for the Location grids are either ISUBCAT1= CGX and ISUBCAT2= CGY for the cartographic X (Easting) and Y (Northing) bands, or ISUBCAT1= GGX, and ISUBCAT2= GGY, for the geographic X(longitude), and Y(latitude) bands. Standard values for the matrix data should be taken from DIGEST part 4 annex B.	6	BCS-A User defined (Default is spaces)	R
IFC _{nn}	<u>nnth Band Image Filter Condition</u> . This field shall contain the value N (to mean none). Other values are reserved for future use.	1	N	R
IMFLT _{nn}	<u>nnth Band Standard Image Filter Code</u> . This field is reserved for future use. It shall be filled with BCS spaces (code 0x20).	3	Fill with spaces	R
NLUTS _{nn}	<u>nnth Band Number of LUTS</u> . This field shall contain the number of look-up tables associated with the nn th band of the image. Use of the look-up tables is user defined in all cases after the first band.	1	BCS-N integer 0-4	R
NELUT _{nn}	<u>nnth Band Number of LUT Entries</u> . This field shall contain the number of entries in each of the look-up tables for the nn th band of data. This field shall be omitted if the value in NLUTS _{nn} is 0.	5	BCS-N integer 1-65536	C

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
LUTDnnm	<u>nnth Band Data of the mth LUT</u> . This field shall be omitted if the m th LUT of the nn th Band Number of LUTs is 0. Otherwise, this field shall contain the data defining the mm th look-up table for the nn th image band. Each entry in the look-up table is composed of one byte, ordered from most significant bit to least significant bit, representing a value form 0 to 255. To use the look-up table, for each integer k, $0 \leq k \leq \text{NELUTnn}-1$, the pixel value k in the nn th image band shall be mapped to the value of the k th byte of the look-up table. This field supports only integer band data (PVTYPE = INT). NOTE: This is a repeating field based on the value of NLUTSnn. When there are more than one table (NELUTnn>1, the net effect is to have the LUT ordered in band sequential fassion, e.g., all the red values followed by green values followed by blue values.	† ³	LUT Values	C
ISYNC	<u>Image Sync code</u> . This field shall contain BCS 0 (code 0x30)	1	0	R

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
IMODE	<p><u>Image Mode</u>. This field shall contain an indicator of whether the image bands are stored in the file sequentially or band interleaved by block or band interleaved by pixel format. Valid values are B, P, and S. The significance of the IMODE value must be interpreted with the knowledge of whether the image is JPEG compressed (IC= C3, C5, M3, or M5), VQ compressed (IC= C4, or M4), or uncompressed (IC= NC or NM). When IC= C1 or M1, the use of IMODE defaults to B.</p> <p>For the uncompressed case: The value S means band sequential, where all blocks for the first band are followed by all blocks for the second band, and so on: [(block1, band1), (block2, band1), ... (blockM, band1)], [(block1, band2), (block2, band 2), ... (blockM, band2)] ... [(block1, bandN), (block2, bandN), ... (blockM, bandN)]. The values B and P indicate variations on block sequential where all data from all bands for the first block is followed by all data from all bands for the second block, and so on. The variations are based on the way the bands are organized within each block. B means band interleaved by block. This means that within each block, the bands follow one another: [(block1, band1), (block1, band2), ... (block1, bandN)], [(block2, band1), (block2, band2), ... (block2, bandN)], ... [(blockM, band1), (blockM, band2), ... (blockM, bandN)]. P means band interleaved by pixel within each block: such as, for each block, one after the other, the full pixel vector (all band values) appears for every pixel in the block, one pixel after another, the block column index varying faster than the block row index. If the NBANDS field is 1, the cases B and S coincide. In this case, this field shall contain B. If the Number of Blocks is 1 (NBPR = NBPC = 1), this field shall contain B for non-interleaved by pixel, and P for interleaved by pixel. The value S is only valid for images with multiple blocks and multiple bands.</p> <p>For the JPEG-compressed case: The presence of B, P, or S implies specific ordering of data within the JPEG image data representation. The interpretation of the values of IMODE for this case is specified in MIL-STD-188-198.</p> <p>For the Vector Quantization compressed case: VQ compressed images are normally either RGB with a color look-up table or monochromatic. In either case, the image is single band, and the IMODE field defaults to B. However, it is possible to have a multiband VQ compressed image in band sequential, band interleaved by block, or band interleaved by pixel format.</p>	1	B, P, S	R

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
NBPR	<u>Number of Blocks Per Row</u> . This field shall contain the number of image blocks in a row of blocks (see paragraph 5.4.2.2) in the horizontal direction. If the image consists of only a single block, this field shall contain the value one.	4	BCS-N integer 0001-9999	R
NBPC	<u>Number of Blocks Per Column</u> . This field shall contain the number of image blocks in a column of blocks (see paragraph 5.4.2.2) in the vertical direction. If the image consists of only a single block, this field shall contain the value one.	4	BCS-N integer 0001-9999	R
NPPBH	<u>Number of Pixels Per Block Horizontal</u> . This field shall contain the number of pixels horizontally in each block of the image. It shall be the case that $NBPR * NPPBH \geq NCOLS$.	4	BCS-N integer 0001-8192	R
NPPBV	<u>Number of Pixels Per Block Vertical</u> . This field shall contain the number of pixels vertically in each block of the image. It shall be the case that $NBPC * NPPBV \geq NROWS$.	4	BCS-N integer 0001-8192	R
NBPP	<u>Number of Bits Per Pixel Per Band</u> . If IC contains NC, NM, C4, or M4, this field shall contain the number of storage bits used for the value from each component of a pixel vector. The value in this field always shall be greater than or equal to Actual Bits Per Pixel (ABPP). For example, if 11-bit pixels are stored in 16 bits, this field shall contain 16 and Actual Bits Per Pixel shall contain 11. If IC = C3, M3, C5, or M5, this field shall contain the value 8 or the value 12. If IC = C1, this field shall contain the value 1.	2	BCS-N integer 01-24	R
IDLVL	<u>Display Level</u> . This field shall contain a valid value that indicates the graphic display level of the image relative to other displayed file components in a composite display. The valid values are 001 to 999. The display level of each displayable file component (image or graphic) within a file shall be unique; that is, each number from 001 to 999 is the display level of, at most, one item. The meaning of display level is fully discussed in paragraph 5.3.3. The image or graphic component in the file having the minimum display level shall have attachment level 0.	3	BCS-N integer 0001-999	R
IALVL	<u>Attachment Level</u> . This field shall contain a valid value that indicates the attachment level of the image. Valid values for this field are 0, and the display level value of any other image or graphic in the file. The meaning of attachment level is fully discussed in paragraph 5.3.4. The image, graphic, or text component in the file having the minimum display level shall have attachment level 0.	3	BCS-N integer 000-998 (Default is 000)	R

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
ILOC	<u>Image Location</u> . The image location is specified by specifying the location of the first pixel of the first line of the image. This field shall contain the image location represented as rrrrrccccc, where rrrrr and ccccc are the row and column offset from the ILOC or SLOC value of the item to which the image is attached. A row or column value of 00000 indicates no offset. Positive row and column values indicate offsets down and to the right and range from 00001 to 99999, while negative row and column values indicate offsets up and to the left and must be within the range -0001 to -9999. The location in the common coordinate system of all displayable graphic components can be computed from the offsets given in the ILOC and SLOC fields.	10	BCS-N integer -9999-9999 to 9999999999 (Default is 0000000000)	R
IMAG	<u>Image Magnification</u> . This field shall contain the magnification (or reduction) factor of the image relative to the original source image. Decimal values are used to indicate magnification, and decimal fraction values indicate reduction. For example, "2.30" indicates the original image has been magnified by a factor of "2.30," while "0.5" indicates the original image has been reduced by a factor of 2. The default value is 1.0, indicating no magnification or reduction. In addition, the following values shall be used for reductions that are reciprocals of nonnegative powers of 2: /2 (for 1/2), /4 (for 1/4), /8 (for 1/8), /16 (for 1/16), /32 (for 1/32), /64 (for 1/64), /128 (for 1/128).	4	BCS-A /2, /4, /8, /16, /32, /64, /128 or decimal value (Default is 1.0 followed by a space)	R
UDIDL	User Defined Image Data Length. This field shall contain the length in bytes in UDID plus 3 (length of UDIDL). This length is 3 plus the sum of the lengths of all the registered tagged record extensions (see paragraph 5.8.1.1) appearing in the UDID field. A value of 0 shall mean that no registered tagged record extensions are included in the header. If a registered tagged record extension exists, the field shall contain the sum of the length of all the registered tagged record extensions (see paragraph 5.7.1.1) appearing in the UDID field plus 3 bytes (length of UDIDL field). If a registered tagged record extension is too long to fit in the UDID field, it shall be put in a data extension segment (see paragraph 5.8.1.3.1.)	5	BCS-N integer 00000 or 000003-99999	R
UDOFL	<u>User Defined Overflow</u> . If present, this field shall contain 000 if the tagged record extensions in UDID do not overflow into a DES, or shall contain the sequence number of the DES into which they do overflow. This field shall be omitted if the field UDIDL contains 0.	3	BCS-N integer 000-999	C

TABLE A-3. NITF image subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
UDID	<u>User Defined Image Data</u> . If present, this field shall contain user defined registered tagged record extensions (see paragraph 5.8.1.1). The length of this field shall be the length specified by the field UDIDL minus 3. Registered tagged record extensions in this field for an image shall contain information pertaining specifically to the image. Registered tagged record extensions shall appear one after the other with no intervening bytes. The first byte of this field shall be the first byte of the first registered tagged record extension appearing in the field. The last byte of this field shall be the last byte of the last registered tagged record extension to appear in the field. This field shall be omitted if the field UDIDL contains 0.	*3	Registered Tagged Record Extensions	C
IXSHDL	<u>Extended Subheader Data Length</u> . This field shall contain the length in bytes in IXSHD plus 3 (length of IXSOFL). The length is 3 plus sum of the lengths of all the controlled tagged record extensions (see paragraph 5.8.1.2) appearing in the IXSHD field. A value of 0 shall mean that no controlled tagged record extensions are included in the image subheader. If a controlled tagged record extension exists, the field shall contain the sum of the length of all the controlled tagged record extensions (see paragraph 5.7.1.2) appearing in the IXSHD field plus 3 bytes (length of IXSOFL field). If a controlled tagged record extension is too long to fit in the IXSHD field, it shall be put in a data extension segment (see paragraph 5.8.1.3.1).	5	BCS-N integer 00000 or 000003-99999	R
IXSOFL	<u>Extended Subheader Overflow</u> . If present, this field shall contain "000" if the tagged record extensions in IXSHD do not overflow into a DES, or shall contain the sequence number of the DES into which they do overflow. This field shall be omitted if the field IXSHDL contains 0.	3	BCS-N integer 000-999	C
IXSHD	<u>Extended Subheader Data</u> . If present, this field shall contain controlled tagged record extensions (see paragraph 5.8.1.2) approved and under configuration management by the ISMC. The length of this field shall be the length specified by the field IXSHDL minus 3. Controlled tagged record extensions in this field for an image shall contain information pertaining specifically to the image. Controlled tagged record extensions shall appear one after the other in this field with no intervening bytes. The first byte of this field shall be the first byte of the first controlled tagged record extension appearing in the field. The last byte of this field shall be the last byte of the last controlled tagged record extension to appear in the field. This field shall be omitted if the field IXSHDL contains 0.	**3	Controlled Tagged Record Extensions	C

†3 One Byte for each entry

*3 As specified in UDIDL

**3 As specified in IXSHDL

TABLE A-3(A). NITF image data mask subheader table.
 TYPE "R" = Required, "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
IMDATOFF	<u>Blocked Image Data Offset</u> . This field is included if the IC value equals NM, M1, M3, M4, or M5. It identifies the offset from the beginning of the Image Data Mask to the first byte of the blocked image data. This offset, when used in combination with the offsets provided in the BMR fields, can provide random access to any recorded image block in any image band.	4	Unsigned integer; Unsigned Binary integer: 0000 to $2^{32} - 1$	C
BMRLNTH	<u>Block Mask Record Length</u> . This field is included if the IC value equals NM, M1, M3, M4, or M5. It identifies the length of each Block Mask Record in bytes. When present, the length of each Block Mask Record is 4 bytes. The total length of all the block Mask Records is equal to BMRLNTH x NBPR x NBPC x NBANDS (one 4 byte record for each block of each band in the image). If all of the image blocks are recorded, this value may be set to 0, and the conditional BMR fields are not recorded/transmitted. Otherwise, the value may be set to 4, and the conditional BMR fields are recorded/transmitted and can be used as an offset index for each image block in each band of the image. If this field is present, but coded as 0, then only a pad pixel mask is included.	2	Unsigned integer; 00 = No Block mask record; 04 = Block mask records (4 bytes each) are present	C
TMRLNTH	<u>Pad Pixel Mask Record Length</u> . This field is included if the IC value equals NM, M1, M3, M4, or M5. It identifies the length of each Pad Pixel Mask Record in bytes. When present, the length of each Pad Pixel Mask Record is 4 bytes. The total length of the Pad Pixel Mask Records is equal to TMRLNTH x NBPR x NBPC x NBANDS (one 4 byte record for each block for each band in the image). If none of the image blocks contain pad pixels, this value is set to 0, and the conditional TMR fields are not recorded/transmitted. For IC value of M3, the value shall be set to 0. If this field is present, but coded as 0, then a Block Mask is included.	2	Unsigned integer; 00 = No Pad pixel mask records; 04 = Pad pixel mask records (4 bytes each) are present	C
TPXCDLNTH	<u>Transparent Output Pixel Code Length</u> . This field is included if the IC value equals NM, M1, M3, M4, or M5. It identifies the length in bits of the Transparent Output Pixel Code. If coded as 0, then no transparent pixels are present, and the TPXCD field is not recorded. For IC value of M3, the value shall be set to 0..	2	Unsigned integer; 00 = No pad pixels; or pad pixel code length in bits (01-16)	C

TABLE A-3(A). NITF image data mask subheader table - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
TPXCD	Pad Output Pixel Code. This field is included if the IC value equals NM, M1, M3, M4, or M5 and TPXCDLNTH is not 0. It contains the output pixel code that represents a pad pixel in the image. This value is unique within the image, and allows the user to identify pad pixels. The pad pixel output code length is determined by TPXCDLNTH, but the value is stored in a maximum of 2 bytes. If the number of bits used by TPXCD is less than the number of bits available for storage, the value shall be justified in accordance with the PJUST field in the image subheader.	*3A	Unsigned Binary integer; 0 to $2^n - 1$ where $n = \text{TPXCDLNTH}$	C
NOTE: The BMRnBNDm record repeats; one 4 byte record for each block of each band in the image.				
BMRnBNDm	Block Mask Record n, Band m. This field shall contain the n^{th} Block Mask Record of band m. It is recorded/transmitted only if the BMRLNTH field is not 0. The field shall contain an offset in bytes from the beginning of the Blocked Image Data to the first byte of block n of band m. If block n of band m is not recorded/transmitted in the image data, the offset value is defaulted to 0xFFFFFFFF. The offsets for all blocks in band 1 are recorded followed by block offsets for band 2, etc. (band sequential). The number of BMR records for each band is NBPR x NBPC.	4	Unsigned Binary integer Increment n prior to m $0 \leq n \leq \text{NBPR} * \text{NBPC} - 1$ $0 \leq m \leq \text{max}(\text{NBANDS}, \text{XBANDS})$ (Default is 0xFFFFFFFF if the block is not recorded)	C
....				
TMRnBNDm	Transparent Pad Pixel Mask Record n, Band m. This field shall contain the n^{th} Transparent Pad Pixel Mask Record Transparent Pad Pixel Mask Record for band m. It is recorded/transmitted only if the TMRLNTH field is not 0. The field shall contain an offset in bytes from the beginning of the Blocked Image Data to the first byte of block n of band m if block n contains transparent pad pixels, or 0xFFFFFFFF to indicate that this block does not contain transparent pad pixels. The offsets for all blocks in band 1 are recorded followed by block offsets for band 2, etc. (band sequential). The number of TMR records for each band is NBPR x NBPC.	4	Unsigned Binary integer Increment n prior to m $0 \leq n \leq \text{NBPR} * \text{NBPC} - 1$ $0 \leq m \leq \text{max}(\text{NBANDS}, \text{XBANDS})$ (Default is 0xFFFFFFFF if the block is not recorded)	C

TABLE A-4. Security control markings. ~~(TBR)~~

CODEWORD	DIGRAPH
NOCONTRACT	NC
ORCON	OC
PROPIN	PI
WNINTEL	WI
LIMDIS	DS
ATOMAL	AL
COSMIC	CS
CNWDI	CN
CRYPTO	CR
FOUO	FO
FORMREST DATA	RD
SIOP	SH
SIOP/ESI	SE
COPYRIGHT	PX
EFTO	TX
LIM OFF USE (UNCLAS)	LU
NONCOMPARTMENT	NT
PERSONAL DATA	IN
SAO	SA
SAO-1	SL
SAO-2	HA
SAO-3	HB
SAO-SI-2	SK
SAO-SI-3	HC
SAO-SI-4	HD
SPECIAL CONTROL	SC
SPECIAL INTEL	SI
WARNING NOTICE - SEC CLAS IS BASED ON THE FACT OF EXISTENCE AND AVAIL OF THIS GRAPHIC	WN

TABLE A-5. NITF graphic subheader.
(TYPE "R" = Required, "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
SY	<u>File Part Type.</u> This field shall contain the characters SY to identify the subheader as a graphic subheader.	2	SY	R
SID	<u>Graphic ID.</u> This field shall contain a valid alphanumeric identification code associated with the graphic. The valid codes are determined by the application.	10	BCS-A User defined, non-blank	R
SNAME	<u>Graphic name.</u> This field shall contain an alphanumeric for the graphic.	20	BCS-A (Default is spaces)	R
SSCLAS	<u>Graphic Security Classification.</u> This field shall contain a valid value representing the classification level of the graphic. Valid values are: T (= Top Secret), S (= Secret), C (= Confidential), R (= Restricted), U (= Unclassified).	1	T, S, C, R, or U	R
SSCODE	<u>Graphic Codewords.</u> This field shall contain a valid indicator of the security compartments associated with the graphic. Valid values are one or more of the following separated by single BCS spaces within the file: digraphs in accordance with table A-4, trigraphs not contained in table A-4, and complete codewords or project numbers. The selection of a relevant set of codewords and project numbers is application specific. If this field is all spaces, it shall imply that no codewords apply to the graphic.	40	BCS-A (Default is spaces)	R
SSCTLH	<u>Graphic Control and Handling.</u> This field shall contain valid security handling instructions associated with the graphic. Valid values are one or more of the following separated by single BCS spaces within the field: digraphs in accordance with table A-4, trigraphs not contained in table A-4, complete words and abbreviations of more than two characters, and phrases only if the words within the phrase are separated by hyphens. The selection of a relevant set of security handling instructions is implementation specific. If this field is all spaces, it shall imply that no graphic control and handling instructions apply.	40	BCS-A (Default is spaces)	R
SSREL	<u>Graphic Releasing Instructions.</u> This field shall contain a valid list of countries and/or groups of countries to which the graphic is authorized for release. Valid items in the list are one or more of the following separated by single BCS spaces within the field: country codes and groupings that are digraphs in accordance with (TBD). If this field is all spaces, it shall imply that no graphic release instructions apply.	40	BCS-A (Default is spaces)	R
SSCAUT	<u>Graphic Classification Authority.</u> This field shall contain a valid identity code of the classification authority for the graphic. The code shall be in accordance with the regulations governing the appropriate security channel(s). If this field is all spaces, it shall imply that no graphic classification authority applies.	20	BCS-A (Default is spaces)	R

TABLE A-5. NITF graphic subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
SSCTLN	<u>Graphic Security Control Number</u> . This field shall contain a valid security control number associated with the graphic. The format of the security control number shall be in accordance with the regulations governing the appropriate security channel(s). If this field is all spaces, it shall imply that no graphic security control number applies.	20	BCS-A (Default is spaces)	R
SSDWNG	<u>Graphic Security Downgrade</u> . This field shall contain a valid indicator that designates the date at which a declassification or downgrading action is to take place. The valid values are (1) the calendar date in the format YYMMDD, or (2) the code "999999" when the originating agency's determination is required (OADR). If this field is all spaces, it shall imply that no graphic security downgrade condition applies.	8	BCS-A (Default is spaces)	R
SENCryp	<u>Encryption</u> . This field shall contain the value 0 until such time as this specification is updated to define the use of other values.	1	0= Not Encrypted	R
SType	<u>Graphic Type</u> . This field shall contain a valid indicator of the representation type of the graphic. The valid value is C, which means Computer Graphics Metafile. The graphic data contain a Computer Graphics Metafile in binary format that defines the graphic according to MIL-STD-2301. Future versions of the NITF may include various predefined objects such as graphics for military units, vehicles, weapons, or aircraft.	1	C for CGM	R
SRES1	<u>Reserved for Future Use</u> . Reserved.	13	BCS-N integer 0000000000000- 9999999999999 (Default is 0000000000000)	R
SDLVL	<u>Display Level</u> . This field shall contain a valid value that indicates the graphic display level of the graphic relative to other displayed file components in a composite display. The valid values are 001 to 999. The display level of each displayable file component (image or graphic) within a file shall be unique; that is, each number from 001 to 999 is the display level of, at most, one item. The meaning of display level is discussed fully in paragraph 5.3.3. The graphic or image component in the file having the minimum display level shall have attachment level 0.	3	BCS-N integer 001-999	R
SALVL	<u>Attachment Level</u> . This field shall contain a valid value that indicates the attachment level of the graphic. Valid values for this field are 0 and the display level value of any other image or graphic in the file. The meaning of attachment level is discussed fully in paragraph 5.3.4. The graphic or image component in the file having the minimum display level shall have attachment level 0.	3	BCS-N integer 000-998 (Default is 000)	R

TABLE A-5. NITF graphic subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
SLOC	<u>Graphic Location</u> . The graphics location is specified by providing the location of a point bearing a particular relationship to the graphic. For a CGM graphic, the point is the Virtual Device Coordinate (VDC) origin as defined in ISO 8632-1. This field shall contain the graphic location represented as rrrrrccccc, where rrrrr and ccccc are the row and column offset from the ILOC or SLOC value of the item to which the graphic is attached. A row and column value of 00000 indicates no offset. Positive row and column values indicate offsets down and to the right and range from 00001 to 99999, while negative row and column values indicate offsets up and to the left and must be within the range -0001 to -9999. The location in this common coordinate system of all displayable graphic components can be computed from the offsets given in the ILOC and SLOC fields.	10	BCS-N -9999≤rrrrr≤99999 -9999≤ccccc≤99999 (Default is 0000000000)	R
SBND1	<u>First Graphic Bound Location</u> . This field shall contain an ordered pair of integers defining a location in Cartesian coordinates for use with CGM graphics. It is the upper left corner of the bounding box for the CGM graphic. See paragraph 5.5.2.1 for a complete description. The format is rrrrrccccc, where rrrrr is the row and ccccc is the column offset from ILOC or SLOC value of the item to which the graphic is attached. If the graphic is unattached (SALVL=0), rrrrr and ccccc represent offsets from the origin of the coordinate system that is common to all images and graphics in the file having attachment level 0. The range for rrrrr and ccccc shall be -9999 to 99999.	10	rrrrrccccc	R
SCOLOR	<u>Graphic Color</u> . If STYPE = C, this field shall contain a C if the CGM contains any color pieces or an M if it is monochrome (i.e., black, white, or levels of gray).	1	C, M	R
SBND2	<u>Second Graphic Bound Location</u> . This field shall contain an ordered pair of integers defining a location in Cartesian coordinates for use with CGM graphics. It is the lower right corner of the bounding box for the CGM graphic. See paragraph 5.5.2.1 for a complete description. The format is rrrrrccccc, where rrrrr is the row and ccccc is the column offset from ILOC or SLOC value of the item to which the graphic is attached. If the graphic is unattached (SALVL=0), rrrrr and ccccc represent offsets from the origin of the coordinate system that is common to all images and graphics in the file having attachment level 0. The range for rrrrr and ccccc shall be -9999 to 99999.	10	rrrrrccccc	R
SRES2	<u>Reserved for Future Use</u> . This field is reserved for future use. The default value shall be BCS spaces.	2	BCS-N integer 00-99 (Default is 00)	R

TABLE A-5. NITF graphic subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
SXSHDL	Extended Subheader Data Length. This field shall contain the length in bytes in SXSHD plus 3 bytes (length of SXSOFL field). This length is 3 plus the sum of the lengths of all the controlled tagged record extensions (see paragraph 5.8.1.2) appearing in the SXSHD field. A value of 0 shall mean that no controlled tagged record extensions are included in the graphic subheader. If a controlled tagged record extension exists, the field shall contain the sum of the length of all the controlled tagged record extensions (see aragraph 5.7.1.2) appearing in the SXSHD field plus 3 bytes (length of SXSOFL field). If a controlled tagged record extension is too long to fit in the SXSHD field, it shall be put in a data extension segment (see paragraph 5.8.1.3.1). Extended Subheader Data Length. This field shall contain the length in bytes in SXSHD plus 3 bytes (length of SXSOFL field). This length is 3 plus the sum of the lengths of all the controlled tagged record extensions (see paragraph 5.8.1.2) appearing in the SXSHD field. A value of 0 shall mean that no controlled tagged record extensions are included in the graphic subheader. If a controlled tagged record extension exists, the field shall contain the sum of the length of all the controlled tagged record extensions (see paragraph 5.7.1.2) appearing in the SXSHD field plus 3 bytes (length of SXSOFL field). If a controlled tagged record extension is too long to fit in the SXSHD field, it shall be put in a data extension segment (see paragraph 5.8.1.3.1).	5	BCS-N integer 00000 or 000003-0099900973	R
SXSOFL	<u>Extended Subheader Overflow</u> . If present, this field shall contain "000" if the tagged record extensions in SXSHD do not overflow into a DES or shall contain the sequence number of the DES into which they do overflow. This field shall be omitted if the field SXSHDL contains 0.	3	BCS-N 000-999	C
SXSHD	<u>Extended Subheader Data</u> . If present, this field shall contain controlled tagged record extensions (see paragraph 5.8.1.2) approved and under configuration management by the ISMC. The length of this field shall be the length specified by the field SXSHDL minus 3. Controlled tagged record extensions in this field for a graphic shall contain information pertaining specifically to the graphic. Controlled tagged record extensions shall appear one after the other in this field with no intervening bytes. The first byte of this field shall be the first byte of the first controlled tagged record extension appearing in the field. The last byte of this field shall be the last byte of the last controlled tagged record extension to appear in the field. This field shall be omitted if the field SXSHDL contains 0.	*5	Controlled Tagged Record Extensions	C

*5 As specified by the SHSHDL field

TABLE A-6. NITF text subheader.
(TYPE "R" = Required, "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
TE	<u>File Part Type</u> . This field shall contain the characters "TE" to identify the subheader as a text subheader.	2	TE	R
TEXTID	<u>Text ID</u> . This field shall contain a valid alphanumeric identification code associated with the text item. The valid codes are determined by the application.	7	BCS-A (User defined, non-blank)	R
XTALVL	<u>Text Attachment Level</u> . This field shall contain a valid value that indicates the attachment level of the text. Valid values for this field are 000 and the display level value of any image or graphic in the file.	3	BCS-N integer 000-998 (Default is 000)	R
XTTDT	<u>Text Date & Time</u> . This field shall contain the time (UTC) of origination of the text in the format CCYYMMDDhhmmss, where CC is the first two digits of the year (00-99), YY is the last two digits of the year (00-99), MM is the month (01-12), DD is the day (01-31), hh is the hour (00-23), mm is the minute (00-59), and ss is the second (00-59). UTC (Zulu) is assumed to be the time zone designator to express the time of day.	14	CCYYMMDDhhmmss	R
XTTTL	<u>Text Title</u> . This field shall contain the title of the text item.	80	BCS-A (Default is spaces)	R
TSCLAS	<u>Text Security Classification</u> . This field shall contain a valid value representing the classification level of the text item. Valid values are: T (= Top Secret), S (= Secret), C (= Confidential), R (= Restricted), U (= Unclassified). -, (TBD)-	1	T, S, C, R, or U	R
TSCODE	<u>Text Codewords</u> . This field shall contain a valid indicator of the security compartments associated with the text item. Valid values are one or more of the following separated by single BCS spaces within the field: digraphs in accordance with table A-4, trigraphs not contained in table A-4, and complete codewords or project numbers. The selection of a relevant set of codewords and project numbers is application specific. If this field is all spaces, it shall imply that no codewords apply to the text item.	40	BCS-A (Default is spaces)	R
TSCTLH	<u>Text Control and Handling</u> . This field shall contain valid security handling instructions associated with the text item. Valid values are one or more of the following separated by single BCS spaces within the field: digraphs in accordance with table A-4, trigraphs not contained in table A-4, complete words and abbreviations of more than two characters, and phrases only if the words within the phrase are separated by hyphens. The selection of a relevant set of security handling instructions is implementation specific. If this field is all spaces, it shall imply that no text control and handling instructions apply.	40	BCS-A (Default is spaces)	R

TABLE A-6. NITF text subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
TSREL	<u>Text Releasing Instruction</u> . This field shall contain a valid list of countries and/or groups of countries to which the text item is authorized for release. Valid items in the list are one or more of the following separated by single BCS spaces within the field: country codes and groupings that are digraphs in accordance with (TBD). If this field is all spaces, it shall imply that no text release instructions apply.	40	BCS-A (Default is spaces)	R
TSCAUT	<u>Text Classification Authority</u> . This field shall contain a valid identity code of the clasificaiton authority for the text item. The code shall be in accordance with the regulations governing the appropriate security channel(s). If this field is all spaces, it shall imply that no text classificaion authority applies.	20	BCS-A (Default is spaces)	R
TSCTLN	<u>Text Security Control Number</u> . This field shall contain a valid security control number associated with the text item. The format of the security control number shall be in accordance with the regulations governing the appropriate security channel(s). If this field is all spaces, it shall imply that no text security control number applies.	20	BCS-A (Default is spaces)	R
TSDWNG	<u>Text Security Downgrade</u> . This field shall contain a valid indicator that designates the time at which a declassification or downgrading aciton is to take place. Valid values are (1) the calendar date in the format YYMMDD, (2) the code "999999" when the originating agency's determination is required (OADR). If this field is all spaces, it shall imply that no text security downgrade condition applies.	6	BCS-A (Default is spaces)	R
ENCRYP	<u>Encryption</u> . This field shall contain the value 0 until such time as this specifidation is updated to define the use of other values.	1	0= Not Encryted	R
TXTFMT	<u>Text Format</u> . This field shall contain a valid three-character code indicating the format or template to be used to display the text. Valid codes are MTF to indicate USMTF (Refer to MIL-STD-6040 for examples of the USMTF format), STA to indicate BCS-A, and OTH to indicate other, such as user defined. Refer to section 3 for additional discussion of standards and the BCS.	3	MTF, STA, OTH	R

TABLE A-6. NITF text subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
TXSHDL	Extended Subheader Data Length. This field shall contain the length in bytes in TSXHD plus 3 bytes (length of TXSOFL field). This length is 3 plus the sum of the lengths of all the controlled tagged record extensions (see paragraph 5.8.1.2 appearing in the TXSHD field. A value of 0 shall mean that no controlled tagged record extensions are included in the text subheader. If a controlled tagged record extension exists, the field shall contain the sum of the length of all the controlled tagged record extensions (see paragraph 5.7.1.2) appearing in the TSXHD field plus 3 bytes (length of TXSOFL field). Extended Subheader Data Length. If present, this field shall contain controlled tagged record extensions (see paragraph 5.8.1.2) approved and under configuration management by the ISMC. The length of this field shall be the length specified by the field TXSHDL minus 3. Controlled tagged record extensions in this field shall contain information pertaining specifically to the text. Controlled tagged record extensions shall appear one after the other in this field with no intervening bytes. The first byte of this field shall be the first byte of the first controlled tagged record extension appearing in the field. The last byte of this field shall be the last byte of the last controlled tagged record extension to appear in the field. This field shall be omitted if the field TXSHDL contains 0.	5	BCS-N integer 00000 or 000003-09717	R
TXSOFL	Extended Subheader Overflow. If present, this field shall contain "000" if the tagged record extensions in TXSHD do not overflow into a DES, or shall contain the sequence number in the file of the DES into which they do overflow. This field shall be omitted if the field TXSHDL contains 0.	3	BCS-N (000-999)	C
TXSHD	Extended Subheader Data. If present, this field shall contain controlled tagged record extensions (see paragraph 5.8.1.2) approved and under configuration management by the ISMC. The length of this field shall be the length specified by the field TXSHDL minus 3. Controlled tagged record extensions in this field shall contain information pertaining specifically to the text. Controlled tagged record extensions shall appear one after the other in this field with no intervening bytes. The first byte of this field shall be the first byte of the first controlled tagged record extension appearing in the field. The last byte of this field shall be the last byte of the last controlled tagged record extension to appear in the field. This field shall be omitted if the field TXSHDL contains 0.	*6	BCS-A	C

*6 As specified by the value in the TXSHDL field

TABLE A-7. Registered and controlled tagged record extension format.
(TYPE "R" = Required, "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
RETAG or CETAG	<u>Unique Extension Type Identifier.</u> This field shall contain a valid alphanumeric identifier properly registered with the ISMC.	6	BCS-A	R
REL or CEL	<u>Length of REDATA Field.</u> This field shall contain the length in bytes of the data contained in REDATA or CETAG. The tagged record's length is 11 + REL or CEL.	5	BCS-N (00001 to 99988)	R
REDATA or CEDATA where appropriate	<u>User-defined Data.</u> This field shall contain data of either binary or character data types defined by and formatted according to user specification. The length of this field shall not cause any other NITF field length limits to be exceeded, but is otherwise fully user defined.	*7	User-defined	R

*7 As indicated in REL field

TABLE A-8. NITF data extension segment subheader.
(TYPE "R" = Required, "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
DE	<u>File Part Type.</u> This field shall contain the characters "DE" to identify the subheader as a data extension.	2	DE	R
DESTAG	<u>Unique DES Type Identifier.</u> This field shall contain a valid alphanumeric identifier properly registered with the ISMC.	25	BCS-A (Registered value only)	R
DESVR	<u>Version of the Data Field Definition.</u> This field shall contain the alphanumeric version number of the use of the tag. The version number is assigned as part of the registration process.	2	BCS-N (01 to 99)	R
DESSG	<u>Security Group.</u> This field shall contain a series of fields containing security classification information for the DES as a whole. The fields included shall mirror those of the NITF file header from FSCLAS through FSDWNG, including field length and content, but be applicable to the DES only. The field names shall be DESCLAS through DESDEVT respectively, simply substituting "DE" for "F."	167	(See table A-1, FSCLAS through FSDWNG)	R
DESOFLW	<u>Overflowed Header Type.</u> This field shall be present if DESTAG = "Registered Extensions" or "Controlled Extensions." Its presence indicates that the DES contains a tagged record extension that would not fit in the file header or component header where it would ordinarily be located. Its value indicates the data type to which the enclosed tagged record is relevant. If the value of DESTAG is "Controlled Extensions," the valid values for DESOFLW are XHD, IXSHD, SXSHD, or TXSHD. If the value of DESTAG is "Registered Extensions," the valid values for DESOFLW are UDHD and UDID.	6	BCS-A (XHD, IXSHD, SXSHD, TXSHD, UDHD, UDID)	C

TABLE A-8. NITF data extension segment subheader - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
DESIEM	<u>Data Item Overflowed</u> . This field shall be present if DESOFLW is present. It shall contain the number of the data item in the file, of the type indicated in DESOFLW to which the tagged record extensions in the segment apply. For example, if DESOFLW = UDID and DESIEM = 3, then the tagged record extensions in the segment apply to the third image in the file. If the value of DESOFLW = UDHD, the value of DESIEM shall be 0.	3	BCS-N (000 to 999)	C
DESSHL	<u>Length of User-defined Subheader Fields</u> . This field shall contain the number of bytes in the field DESSHf. If this field contains 0, DESSHf shall not appear in the DES subheader. This field shall contain 0 if DESTAG = "Registered Extensions" or "Controlled Extensions."	4	BCS-N (0000-9999)	R
DESSHf	<u>User-defined Subheader Fields</u> . This field shall contain user-defined fields. Data in this field shall be alphanumeric, formatted according to user specification.	*8	BCS-A (User defined)	C
DESDATA	<u>User-defined Data Field</u> . This field shall contain data of either binary or character types defined by and formatted according to the user's specification. However, if the DESTAG is "Registered Extensions" or "Controlled Extensions," the tagged records shall appear according to their definition with no intervening bytes. The length of this field shall not cause any other NITF field length limits to be exceeded, but is otherwise fully user defined.	**8	User defined.	R

*8 Value specified in DESSHL

**8 Determined by user. If DESTAG = "Registered Extensions" or "Controlled Extensions," this signifies the sum of the lengths of the included tagged records.

TABLE A-9. NITF reserved extension segment subheader.
(TYPE "R" = Required, "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
RE	<u>File Part Type</u> . This field shall contain the characters "RE" to identify the subheader as a reserved extension.	2	RE	R
RESTAG	<u>Unique RES Type Identifier</u> . This field shall contain a valid alphanumeric identifier properly registered with the ISMC.	25	BCS-A (Registered value only, non-blank)	R
RESVER	<u>Version of the Data Field Definition</u> . This field shall contain the alphanumeric version number of the use of the tag. The version number is assigned as part of the registration process.	2	BCS-N (01 to 99)	R
RESSG	<u>Security Group</u> . This field shall contain a series of fields containing security classification information for the DES as a whole. The fields included shall mirror those of the NITF file header from FSCLAS through FSDWNG, including the field length and content, but be applicable to the DES only. The field names shall be RESCLAS through RESDEVT respectively, simply substituting "RE" for "F."	167	(See table A-1, FSCLAS through FSDWNG)	R
RESSHL	<u>Length of User-defined Subheader Fields</u> . This field shall contain the number of bytes in the field RESSHf. If this field contains 0, RESSHf shall not appear in the RES subheader.	4	BCS-N (0000-9999)	R
RESSHF	<u>User-defined Subheader Fields</u> . This field shall contain user-defined fields. Data in this field shall be alphanumeric, formatted according to user specification.	* ⁹	BCS-A (User defined)	C
RESDATA	<u>User-defined Data Field</u> . This field shall contain data of either binary or character types defined by and formatted according to the user's specification. The length of this field shall not cause any other NITF field length limits to be exceeded, but is otherwise fully user defined.	** ⁹	User defined	R

*⁹ Value specified in RESSHL

**⁹ Determined by the definition of the specific reserved extension segment as registered and controlled with the ISMC.

APPENDIX B

IMPLEMENTATION CONSIDERATIONS

B.1 SCOPE

B.1.1 This appendix is not a mandatory part of the standard. The information contained in it is explanatory and intended for guidance only.

B.1.2 NITF implementation guidelines. The National Imagery Transmission Format (NITF) has been developed to provide image exchange capabilities among computer systems of various designs and capabilities. This appendix discusses general considerations pertinent to successful implementation of the NITF. Guidelines will be presented, and potential problems will be highlighted. The NITF preprocessor and postprocessor software, the software necessary to write and read a NITF file based on host files containing the data items to be included, are to be written by the user. The combination of the preprocessor and postprocessor hereafter will be referred to as the "NITF implementation." Preprocessing is sometimes called "packing," and postprocessing is called "unpacking." NITF implementation sample software is available through your point of contact.

B.2 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

B.3 DEFINITIONS

The definitions in section 3 of this standard apply to this appendix.

B.4 GENERAL REQUIREMENTS

B.4.1 Scope of NITF implementation. NITF describes the format of images and graphics and text within the NITF file only. It does not define the image or text requirements of the host system. The host system is responsible for the handling of unpacked image and text files, as well as image and text display capabilities.

B.4.2 Creating headers and subheaders. This standard specifies legal values for the header and subheader fields. The NITF preprocessor for any particular host system will be responsible for enforcing the field values as stated in this standard.

B.4.3 Character counts. The NITF uses explicit byte counts to delimit fields. No end-of-field characters are used. These byte counts are critical for the proper interpretation of a NITF file. The NITF preprocessor should compute these byte counts based on file contents to insure accuracy. All fields in the NITF header and subheaders must be present exactly as specified in the NITF header and subheader descriptions, and no additional fields may be inserted. The NITF uses various conditional fields whose presence is determined by previous fields and counts. If an expected conditional field is missing, the remainder of the file will be misinterpreted. A similar result will occur if a conditional field is inserted when it is not required. For these reasons, the item count fields are critical, and every effort must be made to ensure their accuracy. The NITF preprocessor should compute these item counts based on file contents whenever possible.

B.4.4 Data entry. To reduce any operator workload imposed by the preprocessor, each preprocessor should provide for the automatic entry of data. Global default values for the particular NITF version should be inserted automatically in the file. System default values, such as the standard size parameters for a base image, also should be entered automatically by the preprocessor. Values that are known to the system, such as the time or the computed size of an overlay, also should be entered automatically.

B.4.5 User defined header and user defined image subheader data. Users may need to add additional data to a NITF file header or image subheader. To accommodate this requirement, user defined data fields are provided in the file header and image subheader. One potential use for the user defined image subheader data is to provide space for directly associating acquisition parameters with the image. Use of these fields requires insertion of tagged records that implement the extension as described in this standard. Before use, tags shall be registered with ~~ISMC~~ **the JITC** according to procedures available from the NTB. This procedure ensures that different users will not use the same tag to flag different extended data. It also provides for configuration management of tagged record formats where the extended data are expected to be used by a wide audience of users.

B.4.5.1 Handling the extended headers and subheaders. The NITF has made allowances for future enhancements by defining extended headers and subheaders, the contents of which are under configuration control. These fields should not be used except as provided for in documentation available from the ~~ISMC~~**JITC**. These extended headers are composed of an extended header byte count and extended header data. The extended header count must be extracted by the software, and the appropriate number of extended header bytes must be read or bypassed. Five extended headers are in the current NITF format under configuration control. They are the Extended Header Data (XHD) in the NITF Header and the Extended Subheaders in the Image (IXSHD), Graphic (SXSHD), and Text (TXSHD) Subheaders. The NITF also has made allowances for extended headers that are under user control by providing the User Defined Header Data (UDHD) field in the NITF Header and the User Defined Image Data (UDID) field in the Image Subheader. Use of these fields must be coordinated with the ~~ISMC~~ **JITC** by tag registration, but it is not under configuration management. Implementors are reminded that these extended headers also must be handled properly (skip over them if there are no means to interpret them properly).

B.4.6 Out of bounds field values. The file creator is responsible for ensuring that all NITF field values are within the bounds specified by the NITF document. An out-of-bounds value in an NITF field indicates that either an error occurred or that the sending station was not in full compliance with NITF.

B.4.7 Use of images in NITF. The NITF specifies a format for images contained within a NITF file only. A NITF implementation must be capable of translating this format to and from the host systems's local format. Some host systems have multiple formats for binary data. In these cases, the NITF implementation must use the appropriate host format to provide the necessary data exchange services with other system packages. When imagery data of less than M bits-per-pixel is displayed on an M-bit (2^M gray shades) display device, it must be transformed into the dynamic range of the device. One way to do this is to modify the LUTs of the display device. However, if M-bit and less than M-bit imagery is displayed simultaneously, the M-bit image will appear distorted. The recommended method is to convert the less than M-bit imagery into M-bit imagery, then use the standard LUTs. The following equation will transform a less than M-bit pixel into an M-bit pixel:

N = number of bits-per-pixel

P_N = N-bit pixel value

P_M = M-bit pixel value

$$P_M = \frac{2^M - 1}{2^N - 1} P_N$$

B.4.8 Use of text files in the NITF. The text format field is provided to help the reader of the file determine how to interpret the text data received. The file reader is responsible for interpreting the various text formats. Format designations explicitly supported by the NITF are as follows:

B.4.8.1 NITF BCS. NITF BCS is a special format to provide a common format for all NITF implementations. The BCS code shall be represented as depicted in tables B-1 and B-2. This is the BCS code represented in ISO 10646. The BCS codes shall be seven bits, a_1 thru a_7 with an eighth bit added. The eighth bit, a_8 , shall be set to 0. A_8 shall be the Most Significant Bit (MSB), and a_1 shall be the Least Significant Bit (LSB). It is intended to provide for simple communications among NITF stations. The NITF BCS format is comprised of the following BCS characters (all numbers are decimal): Line Feed (10), Form Feed (12), Carriage Return (13), and space (32) through tilde (126). This set includes all the alphanumeric characters as well as all commonly used punctuation characters. All lines within a NITF BCS text segment will be separated by carriage return/line feed pairs. It is the responsibility of the local system to translate these pairs into the local format. NITF BCS has no standard line length. The host system must be capable of processing lines that are longer than the local standard. For NITF headers and subheaders, BCS codes are further restrained.

B.4.8.1.1 BCS-N (Numeric format). The range of allowable characters for BCS-N consists of the numbers '0' through '9' from the BMP block named 'BASIC LATIN,' codes 30 through 39 and the following:

Slant bar	code 2#F
Plus	code 2B
Minus	code 2D
Decimal point	code 2E

B.4.8.1.2 BCS-A (Alphanumeric format). The range of allowable characters for BCS-A consists of the following:

Space through Tilde	codes 20 through 7E (BMP block 'BASIC LATIN')
---------------------	---

B.4.8.2 Other. "Other" will allow all ISO 10646 codes to be used. Different systems interpret these codes for various purposes. This format should be restricted to uses where the receiving and transmitting stations have agreed beforehand what the format represents.

TABLE B-1. Basic Latin character set.

	000	001	002	003	004	005	006	007
0	000	016	SP	0	@	P	`	p
			032	048	064	080	096	112
1	001	017	!	1	A	Q	a	q
			033	049	065	081	097	113
2	002	018	“	2	B	R	b	r
			034	050	066	082	098	114
3	003	019	#	3	C	S	c	s
			035	051	067	083	099	115
4	004	020	\$	4	D	T	d	t
			036	052	068	084	100	116
5	005	021	%	5	E	U	e	u
			037	053	069	085	101	117
6	006	022	&	6	F	V	f	v
			038	054	070	086	102	118
7	007	023	‘	7	G	W	g	w
			039	055	071	097	103	119
8	008	024	(	8	H	X	h	x
			040	056	072	088	104	120
9	009	025	)	9	I	Y	i	y
			042	057	073	089	1005	121
A	010	026	*	:	J	Z	j	z
			042	058	074	090	106	122
B	011	027	+	;	K	[	k	{
			043	059	075	091	107	123
C	012	028	‘	<	L	\	l	|
			044	060	076	092	108	124
D	013	029	-	=	M	]	m	}
			045	061	077	093	109	125
E	014	030	.	>	N	^	n	~
			046	062	078	094	110	126
F	015	031	/	?	O	¯	o	
			047	063	079	095	111	128

TABLE B-2. Latin supplement character set.

	008	009	00A	00B	00C	00D	00E	00F
0			NB SP	°	À	Đ	à	đ
	128	144	160	176	192	208	224	240
1			ı	±	Á	Ñ	á	ñ
	129	145	161	177	193	209	225	241
2			ç	²	Â	Ò	â	ò
	130	146	162	178	194	210	226	242
3			ƒ	³	Ã	Ó	ã	ó
	131	147	163	179	195	211	227	243
4			¤	´	Ä	Ô	ä	ô
	132	148	164	180	196	212	228	244
5			¥	µ	Å	Õ	å	õ
	133	149	165	181	197	213	229	245
6			¦	¶	Æ	Ö	æ	ö
	134	150	166	182	198	214	230	246
7			§	·	Ç	×	ç	÷
	135	151	167	183	199	215	231	247
8			¨	¸	È	Ø	è	ø
	136	152	168	184	200	216	232	248
9			©	¹	É	Ù	é	ù
	137	153	169	185	201	217	233	249
A			ª	º	Ê	Ú	ê	ú
	138	154	170	186	202	218	234	250
B			«	»	Ë	Û	ë	û
	139	155	171	187	203	219	235	251
C			¬	¼	Ì	Ü	ì	ü
	140	156	172	188	204	220	236	252
D			-	½	Í	Ý	í	ý
	141	157	173	189	205	221	237	253
E			®	¾	Î	Þ	î	þ
	142	158	174	190	206	222	238	254
F			-	¿	Ï	ß	ï	ÿ
	143	159	175	191	207	223	239	255

TABLE B-3. Basic Latin character set explanation.

Decimal	Hex	Name
032	20	SPACE
033	21	EXCLAMATION MARK
034	22	QUOTATION MARK
035	23	NUMBER SIGN
036	24	DOLLAR SIGN
037	25	PERCENT SIGN
038	26	AMPERSAND
039	27	APOSTROPHE
040	28	LEFT PARENTHESIS
041	29	RIGHT PARENTHESIS
042	2A	ASTERISK
043	2B	PLUS SIGN
044	2C	COMMA
045	2D	HYPHEN-MINUS
046	2E	FULL STOP
047	2F	SOLIQUS
048	30	DIGIT ZERO
049	31	DIGIT ONE
050	32	DIGIT TWO
051	33	DIGIT THREE
052	34	DIGIT FOUR
053	35	DIGIT FIVE
054	36	DIGIT SIX
055	37	DIGIT SEVEN
056	38	DIGIT EIGHT
057	39	DIGIT NINE
058	3A	COLON
059	3B	SEMICOLON
060	3C	LESS-THAN SIGN
061	3D	EQUALS SIGN
062	3E	GREATER-THAN SIGN
063	3F	QUESTION MARK
064	40	COMMERCIAL AT
065	41	LATIN CAPITAL LETTER A
066	42	LATIN CAPITAL B
067	43	LATIN CAPITAL C
068	44	LATIN CAPITAL D
069	45	LATIN CAPITAL E
070	46	LATIN CAPITAL F
071	47	LATIN CAPITAL G
072	48	LATIN CAPITAL H
073	49	LATIN CAPITAL I
074	4A	LATIN CAPITAL J
075	4B	LATIN CAPITAL K
076	4C	LATIN CAPITAL L
077	4D	LATIN CAPITAL M
078	4E	LATIN CAPITAL N
079	4F	LATIN CAPITAL O
080	50	LATIN CAPITAL P
081	51	LATIN CAPITAL Q

TABLE B-3. Basic Latin character set explanation - Continued.

Decimal	Hex	Name
082	52	LATIN CAPITAL R
083	53	LATIN CAPITAL S
084	54	LATIN CAPITAL T
085	55	LATIN CAPITAL U
086	56	LATIN CAPITAL V
087	57	LATIN CAPITAL W
088	58	LATIN CAPITAL X
089	59	LATIN CAPITAL Y
090	5A	LATIN CAPITAL Z
091	5B	LEFT SQUARE BRACKET
092	5C	REVERSE SOLIDUS
093	5D	RIGHT SQUARE BRACKET
094	5E	CIRCUMFLEX ACCENT
095	5F	LOW LINE
096	60	GRAVE ACCENT
097	61	LATIN SMALL LETTER A
098	62	LATIN SMALL LETTER B
099	63	LATIN SMALL LETTER C
100	64	LATIN SMALL LETTER D
101	65	LATIN SMALL LETTER E
102	66	LATIN SMALL LETTER F
103	67	LATIN SMALL LETTER G
104	68	LATIN SMALL LETTER H
105	69	LATIN SMALL LETTER I
106	6A	LATIN SMALL LETTER J
107	6B	LATIN SMALL LETTER K
108	6C	LATIN SMALL LETTER L
109	6D	LATIN SMALL LETTER M
110	6E	LATIN SMALL LETTER N
111	6F	LATIN SMALL LETTER O
112	70	LATIN SMALL LETTER P
113	71	LATIN SMALL LETTER Q
114	72	LATIN SMALL LETTER R
115	73	LATIN SMALL LETTER S
116	74	LATIN SMALL LETTER T
117	75	LATIN SMALL LETTER U
118	76	LATIN SMALL LETTER V
119	77	LATIN SMALL LETTER W
120	78	LATIN SMALL LETTER X
121	79	LATIN SMALL LETTER Y
122	7A	LATIN SMALL LETTER Z
123	7B	LEFT CURLY BRACKET
124	7C	VERTICAL LINE
125	7D	RIGHT CURLY BRACKET
126	7E	TILDE

TABLE B-4. Latin supplement character set explanation .

Decimal	Hex	Name
160	A0	NO BREAK SPACE
161	A1	INVERTED EXCLAMATION MARK
162	A2	CENT SIGN
163	A3	POUND SIGN
164	A4	CURRENCY SIGN
165	A5	YEN SIGN
166	A6	BROKEN BAR
167	A7	SECTION SIGN
168	A8	DIAERESIS
169	A9	COPYRIGHT
170	AA	FEMININE ORDINAL INDICATOR
171	AB	LEFT-POINTING DOUBLE ANGLE QUOTATION MARK
172	AC	NOT SIGN
173	AD	SOFT HYPHEN
174	AE	REGISTERED SIGN
175	AF	MACRON
176	B0	DEGREE SIGN
177	B1	PLUS-MINUS SIGN
178	B2	SUPERSCRIP TWO
179	B3	SUPERSCRIP THREE
180	B4	ACUTE ACCENT
181	B5	MICRO SIGN
182	B6	PILCROW SIGN
183	B7	MIDDLE DOT
184	B8	CEDILLA
185	B9	SUPERSCRIP ONE
186	BA	MASCULINE ORDINAL INDICATOR
187	BB	RIGHT POINTING DOUBLE ANGLE QUOTATION MARK
188	BC	VULGAR FRACTION ONE QUARTER
189	BD	VULGAR FRACTION ONE HALF
190	BE	VULGAR FRACTION THREE QUARTERS
191	BF	INVERTED QUESTION MARK
192	C0	LATIN CAPITAL LETTER A WITH GRAVE
193	C1	LATIN CAPITAL LETTER A WITH ACUTE
194	C2	LATIN CAPITAL LETTER A WITH CIRCUMFLEX
195	C3	LATIN CAPITAL LETTER A WITH TILDE
196	C4	LATIN CAPITAL LETTER A WITH DIAERESIS
197	C5	LATIN CAPITAL LETTER A WITH RING ABOVE
198	C6	LATIN CAPITAL LIGATURE AE
199	C7	LATIN CAPITAL LETTER C WITH CEDILLA
200	C8	LATIN CAPITAL LETTER E WITH GRAVE
201	C9	LATIN CAPITAL LETTER E WITH ACUTE
202	CA	LATIN CAPITAL LETTER E WITH CIRCUMFLEX
203	CB	LATIN CAPITAL LETTER E WITH DIAERESIS
204	CC	LATIN CAPITAL LETTER I WITH GRAVE
205	CD	LATIN CAPITAL LETTER I WITH ACUTE
206	CE	LATIN CAPITAL LETTER I WITH CIRCUMFLEX
207	CF	LATIN CAPITAL LETTER I WITH DIAERESIS
208	D0	LATIN CAPITAL LETTER ETH (ICELANDIC)
209	D1	LATIN CAPITAL N WITH TILDE

TABLE B-4. Latin supplement character set explanation - Continued.

Decimal	Hex	Name
210	D2	LATIN CAPITAL LETTER O WITH GRAVE
211	D3	LATIN CAPITAL LETTER O WITH ACUTE
212	D4	LATIN CAPITAL LETTER O WITH CIRCUMFLEX
213	D5	LATIN CAPITAL LETTER O WITH TILDE
214	D6	LATIN CAPITAL LETTER O WITH DIAERESIS
215	D7	MULTIPLICATION SIGN
216	D8	LATIN CAPITAL LETTER WITH STROKE
217	D9	LATIN CAPITAL LETTER U WITH GRAVE
218	DA	LATIN CAPITAL LETTER U WITH ACUTE
219	DB	LATIN CAPITAL LETTER U WITH CIRCUMFLEX
220	DC	LATIN CAPITAL LETTER U WITH DIAERESIS
221	DD	LATIN CAPITAL LETTER Y WITH ACUTE
222	DE	LATIN CAPITAL LETTER THORN (ICELANDIC)
223	DF	LATIN SMALL LETTER SHARP S (GERMAN)
224	E0	LATIN SMALL A WITH GRAVE
225	E1	LATIN SMALL LETTER A WITH ACUTE
226	E2	LATIN SMALL LETTER A WITH CIRCUMFLEX
227	E3	LATIN SMALL LETTER A WITH TILDE
228	E4	LATIN SMALL LETTER A WITH DIAERESIS
229	E5	LATIN SMALL LETTER A WITH RING ABOVE
230	E6	LATIN SMALL LIGATURE AE
231	E7	LATIN SMALL LETTER C WITH CEDILLA
232	E8	LATIN SMALL LETTER E WITH GRAVE
233	E9	LATIN SMALL LETTER E WITH ACUTE
234	EA	LATIN SMALL LETTER E WITH CIRCUMFLEX
235	EB	LATIN SMALL LETTER E WITH DIAERESIS
236	EC	LATIN SMALL LETTER I WITH GRAVE
237	ED	LATIN SMALL LETTER I WITH ACUTE
238	EE	LATIN SMALL LETTER I WITH CIRCUMFLEX
239	EF	LATIN SMALL LETTER I WITH DIAERESIS
240	F0	LATIN SMALL LETTER ETH (ICELANDIC)
241	F1	LATIN SMALL LETTER N WITH TILDE
242	F2	LATIN SMALL LETTER O WITH GRAVE
243	F3	LATIN SMALL LETTER O WITH ACUTE
244	F4	LATIN SMALL LETTER O WITH CIRCUMFLEX
245	F5	LATIN SMALL LETTER O WITH TILDE
246	F6	LATIN SMALL LETTER O WITH DIAERESIS
247	F7	DIVISION SIGN
248	F8	LATIN SMALL LETTER O WITH STROKE
249	F9	LATIN SMALL LETTER U WITH GRAVE
250	FA	LATIN SMALL LETTER U WITH ACUTE
251	FB	LATIN SMALL LETTER U WITH CIRCUMFLEX
252	FC	LATIN SMALL LETTER U WITH DIAERESIS
253	FD	LATIN SMALL LETTER Y WITH ACUTE
254	FE	LATIN SMALL LETTER THORN (ICELANDIC)
255	FF	LATIN SMALL LETTER Y WITH DIAERESIS

B.4.9 File system constraints. A NITF file is presented as a stream of contiguous bytes. This format may not be suitable for some file systems (e.g. those that store files on block boundaries vice byte boundaries) . The translation of files to and from the local file format for a system should be examined for potential incompatibilities before an implementation is attempted.

B.4.10 Security considerations. A NITF file contains sufficient security information in the file header, image and graphic subheaders to allow implementors to meet virtually any security requirement for displaying classification data. Exact security information handling requirements generally are specified by appropriate accreditation authorities or specific user requirements. It is recommended that implementors extract the classification data from one or more of the header/subheaders and ensure that the information is always displayed whenever the pertinent part of the NITF file is displayed. Implementations should not rely on graphic overlays alone to present security and handling instructions. Panning, roaming, zooming, and other imagery manipulation operations may cause security label graphics to move off the screen or not be printed.

APPENDIX C

SPATIAL DATA EXTENSIONS

C.1 SCOPE

~~This appendix is intended to describe the standard support data extensions (SDEs) used to properly transfer geospatial information by maintaining accuracy, and coordinate data. The nature of raster data is inherently different than vector data because the pixel representations are rows and columns which means the surface of the earth is being mapped to some type of rectangular grid. Map makers have faced this challenge since the beginning of their profession and many solutions have been put forth to project the spheroidal geometry of the earth to a flat surface such as a paper map. Images of the earth's surface inherit additional complexities due to the look angle of cameras and the other imaging parameters such as focal length, atmosphere refraction, etc. Rectifying images to allow exploiters to accurately locate features such as targets and to exchange knowledge of the geospatial location of these features is further motivation to add the support data extensions to the NITF.~~

C.2 APPLICABLE DOCUMENTS

~~STANAG 7074/AGeoP 3A~~ ~~Digital Geographic Information Exchange Standard (DIGEST), Edition 1.2a, June 1995.~~

C.3 DEFINITIONS

~~The definitions in section 3 of this standard apply to this appendix.~~

C.4 GENERAL REQUIREMENTS

~~C.4.1 Approximate geographic location. The IGEOLO and ICOORDS field in the image subheader will be utilized for coarse representation of the geographic or cartographic coordinates of the image.~~

~~C.4.2 Accurate geographic location. The specified tagged records incorporate all SDEs relevant to georeferenced image, matrix, or raster map data such as that defined in the Digital Geographic Information Exchange Standard (DIGEST). The information which makes up the SDE is derived from referenced standards including DIGEST. Systems using DIGEST and/or NIMA's imagery, matrix or raster map data formatted according to NITF should be designed to extract the needed data from the tagged records described herein.~~

~~C.4.3 Coordinate systems.~~

~~C.4.3.1 General. Most people are familiar with the concept of latitude and longitude for locating places on the face of the earth. Most people have also used graph paper to lay out a garden or house plan where distance left right and up down are so many grids cells or simple (x y) orthogonal measurements in inches or centimeters. These principles for coordinates apply in the geospatial sense but more detail is needed to insure data transfer carries the meaning intended by the transmitter to the receiver.~~

~~C.4.3.2 Coordinate system types. Three types of coordinate systems are defined for geospatial information: (1) Geographic (GEO), (2) Cartographic (MAP), and (3) Relative (DIG).~~

~~C.4.3.2.1 GEO. Geographic coordinates are expressed in latitude and longitude and are based on a geodetic datum, including both the geodetic ellipsoid and zero meridian. For the purposes of this standard, the zero meridian will default to GREENWICH (zero degrees longitude). Datums and ellipsoids are carried in the GEOPS extension. DIGEST lists more than 200 different datums. There are so many datums because geodesy continues to refine the understanding of the shape and gravity of the earth. As these refinements mature, maps and other spatial data tend to reflect the best knowledge available at the time the maps and/or data were produced. To properly interpret coordinates one must take into account the mathematics in effect at the time of production. It is often necessary to convert coordinates to a common coordinate system when using data produced in different~~

time frames or by different organizations. Ellipsoids go along with many datums, but DIGEST lists fewer than 60 different ellipsoids. This is because many local datum s exist without reference to an ellipsoid but all global coordinate systems use an ellipsoid. Modern mapping prefers the ellipsoid and datum to be consistent with the World Geodetic System 1984 (WGS84).

———— C.4.3.2.2 MAP. When using a cartographic coordinate system a location is specified as being so many units North/South (Northing) and so many units East/West (Easting) from a reference point within a defined projection plane. The projection is a mathematical relationship that defines a one to one mapping between the geodetic ellipsoid and the projection plane. A cartographic coordinate system is based on a projection (with values for all its associated parameters) applied to a geodetic datum (see above). The projection parameters are described in the GEOPS extension. DIGEST lists approximately 20 different projections and they require from one to four parameters. Note: The cartographic coordinate system may not be described using only PROJECTION field. The geographic coordinate system to which the defined projection applies must always be described.

———— C.4.3.2.3 DIG. A relative coordinate system is the natural occurrence when using a digitizing tool, a scanner, or raw imagery. These relative coordinate systems must be registered to an absolute coordinate system in order to represent real locations. The absolute coordinate systems may be GEO or MAP as described above. The registration between the relative and absolute coordinate systems will be defined either by the description of registration points (generally three or more) or by the description of location grid(s) (at least one).

———— C.4.3.3 Rectified image/raster local coordinate system. Rows and columns of a rectified image/raster data form a regular grid whose axes are parallel to the axes of the absolute coordinate system as defined in the GEOPS extension. In this local coordinate system, coordinate sets are composed of a row number and a column number (r,c). The order in which rows and columns are numbered is described in paragraph 5.4.2. The GEOLO and MAPLO extensions provide the appropriate parameters for computing the spatial location of each pixel from its row and column number.

———— a. MAPLO must be used if the absolute coordinate system is a cartographic coordinate system (E, N). It defines the Easting and Northing of the origin of the grid (LSO,PSO) and the rows and columns width (LOD,LAD) using a defined linear unit (UNILOa).

$$E_ = \text{LSO} + c * LOD * (1_{UNI} / 1_{UNILOa})$$

$$N_ = \text{PSO} + r * LAD * (1_{UNI} / 1_{UNILOa})$$

NB : $(1_{UNI} / 1_{UNILOa})$ means the conversion of the unit of LOD (LAD) given by the field UNILOA into the unit of E (S) called UNI in these formulas. If the units are the same, this ratio is equal to 1.

———— b. GEOLO must be used if the absolute coordinate system is a geographic coordinate system (Long, Lat). It defines the longitude and latitude of the origin of the grid (LSO,PSO), and the number of rows and columns in 360° (ARV,BRV).

$$\text{Lon_} = \text{LSO} + c * (360^\circ)_{UNI} / \text{ARV}$$

$$\text{Lat_} = \text{PSO} + l * (360^\circ)_{UNI} / \text{BRV}$$

NB : $(360^\circ)_{UNI}$ means the value of a 360° angle expressed in the unit of Lat (Long). If the units are degrees, the value is 360.

———— C.4.3.4 GRID reference image. Non-rectified image or matrix data can be accurately georeferenced with a grid reference image file. This is the GRDPS extension. Basically, this involves superimposing a grid of spatial location information on top of the image for which the spatial information applies. For example, the grid could have location information (coordinates) at every 10th image pixel (N-S) and (E-W). Then for every image pixel, one could interpolate, using surrounding grid pixels, to estimate the actual geospatial location. This scheme

eliminates the need to re-sample the base image to place it in a rectified form. This is important if the base image was a map scanned at a relatively low resolution (e.g., 100 dots per inch) and the re-sampling process would tend to make the resultant raster map too blurred to read. This process also allows a very non-linear stretch within the image space to be georeferenced with reasonable accuracy, for example, aircraft reconnaissance using low scan angles. This results in near field pixels relatively close together and far field pixels far apart. Even with a horizon in the image, one can fill pixel spaces above this horizon with null values to signal that spatial location has no meaning in this empty part of the scene. Another advantage of the grid-reference is the simplification of the application software. By using the same grid reference scheme for various types of imagery, the application software can use the same logic and not require a library of algorithms for various projection and sensor parameter solutions.

The extension includes the file identifier (BAD) of the grid image subfile and precise coordinates of four bounding corners. It also contains the absolute elevation of the grid relative to mean sea level (WGS84). The elevation data provides spatial data refinement in areas where terrain relief complicates the geospatial reference problem. For regions of pronounced differences in terrain elevation, it may be necessary to include several sets of grid reference images where the elevation of the grid is adjusted to best match the terrain elevation over that region.

The grid image subfile is a NITF subimage containing two bands: band X and band Y, giving the coordinates for each grid element.

If (c,r) are the row and column numbers of a pixel within the image, (PSO,LSO) the origin of the location grid in columns and rows within the image, (LOD,LAD) the data density of the location grid in columns and rows, the column and row number (LGC,LGR) of the location grid pixel from which the location of the pixel (c,r) can be computed will be:

$$Lgc = (c - LSO) / LOD \quad Lgr = (r - PSO) / LAD$$

And the exact location of the pixel (c,r) may be interpolated from the value of each coordinate band (band X and band Y) within the location grid as:

$$X(c,r) = \text{BandX}(Lgc, Lgr) + \frac{(\text{BandX}(Lgc + 1, Lgr) - \text{BandX}(Lgc, Lgr)) * (c - Lgc * LOD)}{LOD}$$

$$Y(c,r) = \text{BandY}(Lgc, Lgr) + \frac{(\text{BandY}(Lgc, Lgr + 1) - \text{BandY}(Lgc, Lgr)) * (r - Lgr * LAD)}{LAD}$$

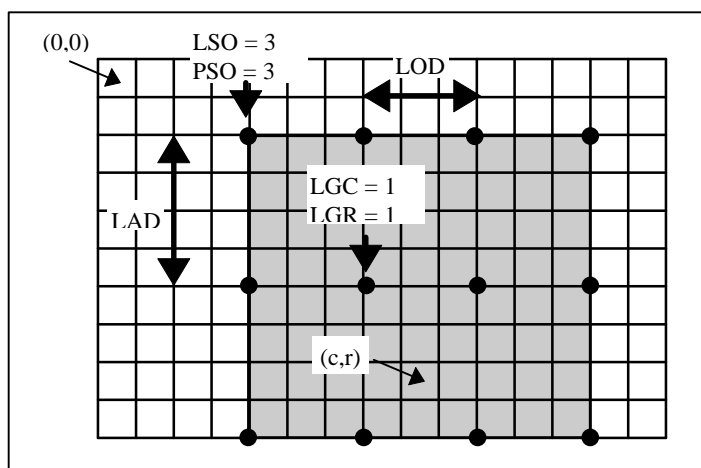


FIGURE C 1. Example of a location grid.

~~C.4.3.5 Registration points.~~ Each registration point is described by two sets of coordinates: one describes the position of the point using the absolute coordinate system (as described in the GEOPS extension), the other describes the position of the same point in the relative coordinate system (as used in the dataset). The REGPT extension is used to support relative coordinate systems. Note: The position accuracy will be affected by the mathematical function used to transform the coordinates from the relative coordinate system to the absolute one. This process is often referred to a "rubber sheeting" or "warping" an image (or scanned raster file) to best fit an absolute coordinate system. The mathematics will obviously be improved if approximate pixel-spacing (in terms of the absolute coordinate system) is known.

~~C.4.3.6 Georeference values for certain standard products.~~ Several standard raster map products exist for which the georeference values are understood by default. These default values are summarized in this section:

~~* Arc Standard Raster Products (ASRP)~~

Type	Geographic (GEO)
Units	Seconds (SEC)
Ellipsoid	WGS84
Datum	WGS84
Projection	ARC (using Zone Number supplied in GEOLO)

~~* UTM/UPS Standard Raster Products (USRP)~~

Type	Cartographic (MAP)
Units	Meters (M)
Ellipsoid	WGS84
Datum	WGS84

If Zone Number is + 60 to 1 (for north of Equator) or - 60 to 1 (for south of Equator) the default projection will be:

Projection	Universe Transverse Mercator
Parameter 1	Central Meridian for UTM Zone (Given in MAPLO)
Parameter 2	0.9996
Parameter 3	None
Parameter 4	None
X(Easting) false origin of projection	500000
Y(Northing) false origin of projection	0(N) or 10000000(S)
consistent with Zone Number given in MAPLO Extension	

If Zone Number is + 61 or - 61 the default projection will be:

Projection	Universal Polar Stereographic
Parameter 1	0 or 648000
Parameter 2	0.994
Parameter 3	None
Parameter 4	None
X(Easting) false origin of projection	2000000
Y(Northing) false origin of projection	2000000

~~C.4.4 Positional accuracy.~~ Positional accuracy is expressed as a circular error for X,Y value and as linear error for Z-value according to STANAG 2215.

~~C.4.4.1 Horizontal and vertical accuracy regions.~~ There must be 100% areal coverage of the georeferenced image item extent for the total area of the horizontal accuracy regions and 100% areal coverage

of the georeferenced image item extent for the sum of the vertical accuracy regions. Where the information is unknown or not applicable it will be noted with "Not a Number" value. Where the region or sub-region boundaries are coincident with both horizontal and vertical accuracy regions, then the accuracy regions may be combined in the same accuracy support data extension ACCPO. Where the horizontal and vertical boundaries differ in whole or in part, then either totally distinct horizontal and vertical sub-regions may be defined (ACCHZ, ACCVT), or the two approaches may be mixed (e.g., figure C-2).

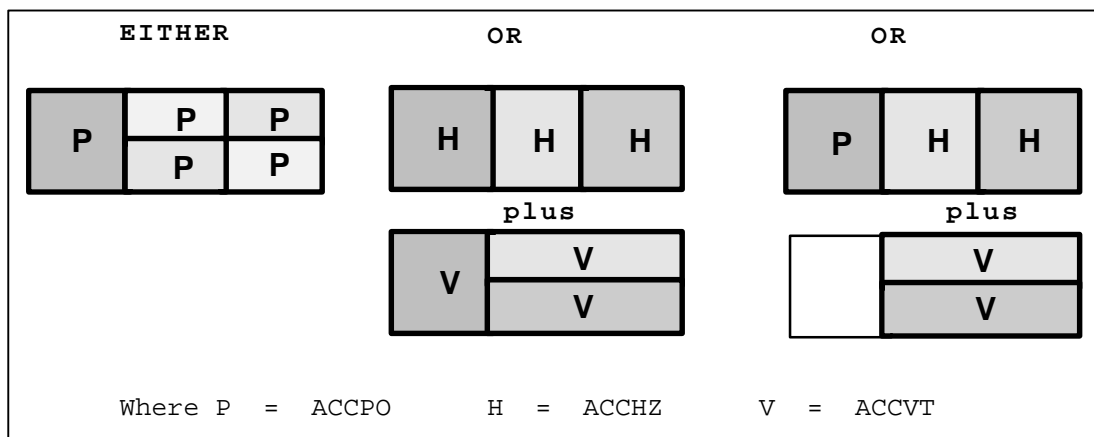


FIGURE C-2. ~~Alternatives for defining mixed positional accuracy areas.~~

C.5 DETAILED REQUIREMENTS

C.5.1 GEOPS - Geo positioning information. GEOPS defines the absolute coordinate system to which the data is georeferenced. This absolute coordinate system may be a geographic system or a cartographic coordinate system. The GEOPS extension is detailed in table C-1. A single GEOPS must be placed in the Image Subheader Extended Subheader Data field for each georeferenced image item in a NITF file.

TABLE C-1. ~~GEOPS - Geo positioning information extension.~~
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A "GEOPS"	R
CEVER	Version.	1	BCS-A "A"	R
CEL	Length of Entire Tagged Record (Number of Bytes).	5	BCS-N 00179	R

The following fields define GEOPS...

TYP	Type of Coordinate System. Type of Coordinate system for the image data: GEO: longitude, latitude; MAP: Easting, Northing; DIG longitude, latitude or Easting, Northing registered through a location grid or registration points.	3	BCS-A MAP, GEO, or DIG	R
UNI	Units of Measure for Coordinates. Units of measure for this dataset. (See DIGEST 1.2, Part 3-10)	3	BCS-A See DIGEST Part 3	R
ELL	Ellipsoid Name. Name of the ellipsoid to which the Dataset refers. (See DIGEST 1.2 Part 3-10)	25	BCS-A DIGEST Part 3	R
ELC	Ellipsoid Code. Code of the ellipsoid to which the Dataset refers.	3	"	R

TABLE C 1. ~~GEOPS—Geo-positioning information extension—Continued.~~

FIELD	NAME	SIZE	VALUE RANGE	TYPE
DVR	<u>Vertical Datum Name.</u>	25	BCS-A DIGEST Part 3	C
VDCdvr	<u>Vertical Datum Code.</u>	4	“	C
DAG	<u>Datum Geodetic Name.</u>	25	“	R
DCD	<u>Datum Geodetic Code.</u>	4	“	R
PRN	<u>Projection Name.</u>	25	BCS-A see DIGEST Part 3	C
PCO	<u>Projection Code.</u>	2	“	C
PAA	<u>Proj. Param No. 1.</u>	10	BCS-N see DIGEST Part 3	C
PAB	<u>Proj. Param No. 2.</u>	10	“	C
PAC	<u>Proj. Param No. 3.</u>	10	“	C
PAE	<u>Proj. Param No. 4.</u>	10	“	C
XOR	<u>Projection False X (Easting) Origin.</u>	10	“	C
YOR	<u>Projection False Y (Northing) Origin.</u>	10	“	C

C.5.2 ~~GRDPS—Grid reference data.~~ When the image, matrix, or raster data is not rectified, the geographic location of each pixel may be derived from a given set of location grids computed for a given elevation. The user defined fields of the GRDPS extension are detailed in table C 2. A single GRDPS is placed in the Image Subheader, following GEOPS.

TABLE C 2. ~~GRDPS—Grid reference data extensions.~~

(TYPE “R” = Required “C” = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	<u>Unique Extension Identifier.</u>	5	BCS-A GRDPS	R
CEVER	<u>Version.</u>	1	BCS-A “A”	R
CEL	<u>Length of Entire Tagged Record (Number of Bytes).</u>	5	BCS-N $2 + \text{NUM_SETS} * 64$	R

The following fields define GRDPS...

NUM_SETS	<u>Number of Location Grids.</u>	2	BCS-N 01-20	R
----------	----------------------------------	---	----------------	---

For each location grid...

ZVL	<u>Elevation of the Grid (Meters).</u>	10	BCS-N $\pm \text{ZZZZZZZ}$	R
BAD	<u>Identifier of the Grid Image ID File.</u>	10	BCS-A	R
SWO	<u>Westernmost Longitude/Easting.</u>	11	BCS-N $\pm \text{ddd.ddddd}/$ $\pm \text{mmmmmmmm.m}$	R
SWA	<u>Southernmost Latitude/Northing.</u>	11	BCS-N $\pm \text{ddd.ddddd}/$ $\pm \text{mmmmmmmm.m}$	R
NEO	<u>Easternmost Longitude/Easting.</u>	11	BCS-N $\pm \text{ddd.ddddd}/$ $\pm \text{mmmmmmmm.m}$	R
NEA	<u>Northernmost Latitude/Northing.</u>	11	BCS-N $\pm \text{ddd.ddddd}/$ $\pm \text{mmmmmmmm.m}$	R

TABLE C 2. GRDPS—Grid reference data extensions—Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
LOD	<u>Data Density in Columns.</u> Number of columns between two spots of the location grid.	5	BCS-N 00001-99999	R
LAD	<u>Data Density in Rows.</u> Number of rows between two spots of the location grid.	5	BCS-N 00001-99999	R
LSO	<u>Column Number of the Origin of the Location Grid.</u>	11	BCS-N ± mmmmmmmmm.m	R
PSO	<u>Row Number of the Origin of the Location Grid.</u>	11	BCS-N ± mmmmmmmmm.m	R
NCOLS	<u>Number of Columns in the Location Grid.</u>	8	BCS-N 00000001-99999999	R
NROWS	<u>Number of Rows in the Location Grid.</u>	8	BCS-N 00000001-99999999	R

C.5.3 GEOLO local geographic (lat/lon) coordinate system. For rectified data (rows and columns are aligned with the coordinate system axis) GEOLO provides the description of the link between the local coordinate system (rows and columns) and the absolute geographic coordinate system (longitude and latitude). The user-defined fields of the GEOLO extension are detailed in table C 3. A single GEOLO is placed in the Image Subheader, following GEOPS.

TABLE C 3. GEOLO local geographic coordinate system extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	<u>Unique Extension Identifier.</u>	5	BCS-A GEOLO	R
CEVER	<u>Version.</u>	1	BCS-A A	R
CEL	<u>Length of Entire Tagged Record (Number of Bytes).</u>	5	BCS-N 00043	R

The following fields define GEOLO...

ARV	<u>Number of Elements in 360 Degrees (E-W).</u> Pixel ground spacing...number of pixels in 360-degrees (E-W)	9	BCS-N 000000002— 999999999	R
BRV	<u>Number of Elements in 360 Degrees (N-S).</u> Pixel ground spacing...number of pixels in 360-degrees (N-S)	9	BCS-N 000000002— 999999999	R
LSO	<u>Longitude of Reference Origin.</u>	11	BCS-N ± ddd.dddddd	R
PSO	<u>Latitude of Reference Origin.</u>	11	BCS-N ± ddd.dddddd	R

C.5.4 MAPLO local cartographic (x, y) coordinate system. For rectified data (rows and columns are aligned with the coordinate system axis) MAPLO provides the description of the link between the local coordinate system (rows and columns) and the absolute cartographic coordinate system (easting and northing). The user-defined fields of the MAPLO extension are detailed in table C 4. A single MAPLO is placed in the Image Subheader, following GEOPS.

TABLE C.4. ~~MAPLO local cartographic coordinate system extension.~~
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	<u>Unique Extension Identifier.</u>	5	BCS-A MAPLO	R
CEVER	<u>Version.</u>	1	BCS-A A	R
CEL	<u>Length of Entire Tagged Record (Number of Bytes).</u>	5	BCS-N 00038	R

The following fields define MAPLO ...

LOD	<u>Data Density for E/W Direction. Data interval in E-W direction</u>	5	BCS-N 00001-99999	R
LAD	<u>Data Density for N/S Direction. Data interval in N-S direction</u>	5	00001-99999	R
UNIl oa	<u>Units of Measurement of LOD and LAD.</u>	3	BCS-A see DIGEST Part 3	R
LSO	<u>Easting of Reference Origin.</u>	11	BCS-N ± mmmmmmmmm.m	R
PSO	<u>Northing of Reference Origin.</u>	11	BCS-N ± mmmmmmmmm.m	R

C.5.5 ~~REGPT Registration Points.~~ Registration points may be provided for image or map data to identify specific pixels in this data and provide spatial locations (geographic or cartographic) for these pixel s. With this information the entire image or map pixel set can be adjusted to improve overall accuracy. The extension is called REGPT and table C.5 details the user defined fields.

TABLE C.5. ~~REGPT Registration point extension.~~
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	<u>Unique Extension Identifier.</u>	5	BCS-A REGPT	R
CEVER	<u>Version.</u>	1	BCS-A A	R
CEL	<u>Length of Entire Tagged Record (Number of Bytes).</u>	5	(BCS_N) 2 + NUM_PTS * 71	R

The following fields define REGPT ...

NUM_PTS	<u>Number of Registration Points to Follow.</u>	2	BCS-N 00-99	R
---------	---	---	----------------	---

For each registration point...

PID	<u>Point Identification.</u>	5	BCS-A	R
LON	<u>Longitude/Easting of Registration Point.</u>	11	BCS-N ± ddd.dddddd/ ± mmmmmmmmm.m	R
LAT	<u>Latitude/Northing of Registration Point.</u>	11	BCS-N ± ddd.dddddd/ ± mmmmmmmmm.m	R
ZVL	<u>Elevation of Registration Point.</u>	11	BCS-N ± mmmmmmmmm.m	C

TABLE C.5. REGPT—Registration point extension—Continued

FIELD	NAME	SIZE	VALUE RANGE	TYPE
DIX	<u>Column Number of Registration Point.</u>	11	BCS-N 00000000001- 99999999999	R
DIY	<u>Row Number of Registration Point.</u>	11	BCS-N 00000000001- 99999999999	R
DIZ	<u>Local Z-Coordinate of Registration Point.</u>	11	BCS-N ± mmmmmmmmm.m	C

C.5.6 ACCPO—Positional accuracies. The user defined fields of the ACCPO extension are detailed in table C-6. If horizontal (ACCHZ) and vertical (ACCVT) extensions are used then ACCPO will not be used.

TABLE C-6. ACCPO—Positional accuracy extension.
(TYPE “R” — Required “C” — Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	<u>Unique Extension Identifier.</u>	5	(BCS-A) ACCPO	R
CEVER	<u>Version.</u>	1	BCS-A A	R
CEL	<u>Length of Entire Tagged Record (Number of Bytes).</u>	5	BCS-N 2 + NUM_SETS * (34 + NUM_COO*22)	R

The following fields define ACCPO...

NUM_SETS	<u>Number of ACCPO Record Sets to Follow.</u> This field defines the number of accuracy sets to follow. The number will be “01” if the entire dataset only has one set of accuracies. If vertical and horizontal accuracies are not homogeneous within definable regions then there may be different numbers of sets between horizontal and vertical. The maximum number of regions is limited to 20.	2	BCS-N 01—20	R
For each ACCPO record...				
AAH	<u>Absolute Horizontal Accuracy.</u> Absolute horizontal accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNlaah	<u>Unit of Measure for AAH.</u> Units for AAH (See DIGEST Part 3)	3	BCS-A	R
AAV	<u>Absolute Vertical Accuracy.</u> Absolute vertical accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNlaav	<u>Unit of Measure for AAV.</u> Units for AAV (See DIGEST Part 3)	3	BCS-A	R
APH	<u>Point to Point (Relative) Horizontal.</u> Point to point (relative) horizontal accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNlaph	<u>Unit of Measure for APH.</u> Units for APH (See DIGEST Part 3)	3	BCS-A	R

TABLE C-6. ~~ACCPQ~~ Positional accuracy extension—Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
APV	Point to Point (Relative) Vertical. Point to point (relative) vertical accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNlapv	Unit of Measure for APV. Units for APV (See DIGEST Part 3)	3	BCS-A	R
NUM_COO	Number of Coordinates in Bounding Polygon. This field defined the number of coordinate pairs that are used to define a sub-region. If the accuracy information applies to the entire dataset, then this field does not apply and will be zero filled.	2	BCS-N 00-20	C

For each coordinate pair...

LON	Longitude(DEC)/Easting (M). Longitude or Easting coordinate value. (Longitude in decimal degrees and Easting in meters)	11	BCS-N ± ddd.ddddd/ ± mmmmmmmmm.m	C
LAT	Latitude (DEC)/Northing(M). Latitude or Northing coordinate value. (Latitude in decimal degrees and Northing in meters).	11	BCS-N ± ddd.ddddd/ ± mmmmmmmmm.m	C

C.5.7 ~~ACCHZ~~ Horizontal accuracies. The user defined fields of the ACCHZ extension are detailed in table C-7.

TABLE C-7. ~~ACCHZ~~ Horizontal extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A ACCHZ	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Entire Tagged Record (Number of Bytes).	5	BCS-N $2 + \text{NUM_SETS} *$ ($18 + \text{NUM_COO} * 22$)	R

The following fields define ACCHZ...

NUM_SETS	Number of ACCHZ Record Sets to Follow. This field defines the number of accuracy sets to follow. The number will be "01" if the entire dataset only has one set of accuracies. If vertical and horizontal accuracies are not homogeneous within definable regions then there may be different numbers of sets between horizontal and vertical. The maximum number of regions is limited to 20.	2	BCS-N 01-20	R
----------	---	---	----------------	---

For each ACCHZ record...

AAH	Absolute Horizontal Accuracy. Absolute horizontal accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNlaah	Unit of Measure for AAH. Units for AAH (See DIGEST Part 3)	3	BCS-A	R

TABLE C-7. ~~ACCHZ—Horizontal extension—Continued.~~

FIELD	NAME	SIZE	VALUE RANGE	TYPE
APH	Point to point (Relative) Horizontal. Point to point (relative) horizontal accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNlaph	Unit of Measure for APH. Units for APH (See DIGEST Part 3)	3	BCS-A	R
NUM_COO	Number of Coordinates in Bounding Polygon. This field defined the number of coordinate pairs that are used to define a sub-region. If the accuracy information applies to the entire dataset, then this field does not apply and will be zero filled.	2	BCS-N 00-20	C

For each coordinate pair...

LON	Longitude(DEG)/Easting (M). Longitude or Easting coordinate value (Longitude in decimal degrees and Easting in meters).	11	BCS-N ± ddd.ddddd/ ± mmmmmmmmm.m	C
LAT	Latitude (DEG)/Northing (M). Latitude or Northing coordinate value. (Latitude in decimal degrees and Northing in meters).	11	BCS-N ± ddd.ddddd/ ± mmmmmmmmm.m	C

C.5.8. ~~ACCVT—Vertical accuracies.~~ The user defined fields of the ACCVT extension are detailed in table C-8.

TABLE C-8. ~~ACCVT—Vertical accuracy extension.~~
(TYPE “R” = Required “C” = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A ACCVT	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Entire Tagged Record (Number of Bytes).	5	BCS-N $2 + \text{NUM_SETS} * (18 + \text{NUM_COO} * 22)$	R

The following fields define ACCVT...

NUM_SETS	Number of ACCVT Record Sets to Follow. This field defines the number of accuracy sets to follow. The number will be “01” if the entire dataset only has one set of accuracies. If vertical and horizontal accuracies are not homogeneous within definable regions then there may be different numbers of sets between horizontal and vertical. The maximum number of regions is limited to 20.	2	BCS-N 01–20	R
----------	---	---	----------------	---

For each ACCVT record...

AAV	Absolute Vertical Accuracy. Absolute vertical accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNlaav	Unit of Measure for AAV. Units for AAV (See DIGEST Part 3)	3	BCS-A	R

TABLE C 8. ACCVT—Vertical accuracy extension—Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
APV	Point to Point (Relative) Vertical. Point to point (relative) vertical accuracy for the defined region/sub region	5	BCS-N 00000-99999	R
UNlapv	Unit of Measure for APV. Units for APV (See DIGEST Part 3)	3	BCS-A	R
NUM_COO	Number of Coordinates in Bounding Polygon. This field defined the number of coordinate pairs that are used to define a sub region. If the accuracy information applies to the entire dataset, then this field does not apply and will be zero filled.	2	BCS-N 00-20	C
For each coordinate pair...				
LON	Longitude (DEG)/Easting (M). Longitude or Easting coordinate value. (Longitude in decimal degrees and Easting in meters).	11	BCS-N ±ddd.ddddd/ ±mmmmmmmm.m	C
LAT	Latitude (DEG)/Northing (M). Latitude or Northing coordinate value. (Latitude in decimal degrees and Northing in meters).	11	BCS-N ±ddd.ddddd/ ±mmmmmmmm.m	C

APPENDIX D

MAP SOURCE DATA EXTENSION

D.1 SCOPE

~~———— The map source extension (SOURC) provides extensive information about the source graphics (one or more). Since these sources are maps or charts, a cartographic (MAP) coordinate system applies and must include ellipsoid, datum, and projection data. In addition, if elevation or depth information is present on the source map, the vertical or sounding datum must be supplied.~~

D.2 APPLICABLE DOCUMENTS

~~STANAG 7074/AGeoP 3A ————— Digital Geographic Information Exchange Standard (DIGEST), Edition 1.2a, June 1995.~~

D.3 DEFINITIONS

~~———— The definitions in section 3 of this standard apply to this appendix.~~

D.4 GENERAL REQUIREMENTS

~~———— The source graphic may include several map insets and usually includes legend data that is important to capture as raster files. Insets have a specific coordinate system defined which may be different for each one and different than the one used for the main source graphic. The mechanism is the same as for relative coordinate systems with the four corners of the inset interpreted as registration points. Relative coordinates give the location of the outside of the corners (as computed from the row and column number of each corner). Absolute coordinates will give the location of the inside of the corners. Both locations will be described in the same coordinate system as defined in the GEOPS extension. The only transformation allowed is change of scale and offset.~~

~~In northern latitudes, certain maps may include a grid overlay for convenience of navigation where longitude arcs are rapidly converging. The overlays normally include Grid North Magnetic North Angle (GMA) and a Grid Convergence Angle (GCA). Note: When the primary grid displayed on the map is not strictly registered to the map projection, it is best to use the projection to which the primary grid is registered to the map projection. This allows the application to use the parameters of the source file for transforming the coordinates from the coordinate system of the data set to the coordinate system displayed on the grid.~~

D.5 DETAILED REQUIREMENTS

~~———— D.5.1 SOURC Map source description. The user defined fields of the SOURC extension are detailed in table D-1, and the descriptions of these fields are detailed in table TBD.~~

TABLE D-1. ~~SOURCE~~ ~~Source extension.~~
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A "SOURC"	R
CEVER	Version.	1	BCS-A "A"	R
CEL	Length of Entire Tagged Record (Number of Bytes).	5	BCS-N 2 + NUM_SETS * (308 + NUM_MAG * (68 + NUM_COO * 22) + 147 + NIN * 201 + NLI * 27)	R
The following fields define SOURC...				
NUM_SETS	Number of Source Description	2	BCS-N	R
For each source				
BAD	Identifier of Derived Image layer (Image ID)	10	BCS-A	C
NLI	Number of Legend Images	2	BCS-N	R
NIN	Number of Insets	2	BCS-N	R
PRT	Series Designator	10	BCS-A (e.g. 1501G)	R
URF	Unique Source ID (Number or name which, when used with series and edition, will uniquely identify the source)	20	BCS-A	R
EDN	Source Edition Number	7	BCS-A	R
NAM	Full Name of Source Document	20	BCS-A	R
CDP	Type of Significant Date (that most accurately describes basic date of the product for computation of the probable obsolescence date. It can be compilation date, revision date, or other depending on the product and circumstances.)	3	BCS-N (See DIGEST, Part 4, Annex B for date codes) (CDP)	R
CDV	Significant Date Value	8	BCS-A (YYYYMMDD)	R
COU	Country Code	2	BCS-A	R
CDV27	Perishable Information Date Value	8	BCS-A (YYYYMMDD)	R
CDV27	Perishable Information Date Value	8	BCS-A (YYYYMMDD)	R
SCA	Reciprocal Cartographic Scale	9	BCS-N	R
GRD	Cartographic Grid Code	8	BCS-A (See Digest Part 3)	R
SQU	Area Coverage (Number of square units in coverage)	10	BCS-N	R
UNIsqu	Unit of Measure for SQU	3	BCS-A (See DIGEST Part 3)	R
PCI	Predominant Contour Interval	4	BCS-N	R
UNIpai	Unit of Measure for Contour Interval	3	BCS-A (DIGEST Part 3)	R
WPC	Percentage Covered by Water	3	BCS-N	R

TABLE D-1. SOURCE—Source extension—Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
NST	Navigation System Type	3	BCS-N (DIGEST Part 4)	R
ELL	Ellipsoid Name to which the source refers	25	BCS-A (DIGEST Part 3)	R
ELC	Ellipsoid Code	3	BCS-A (DIGEST Part 3)	R
DVR	Datum Vertical Reference	25	BCS-A (DIGEST Part 3)	R
VDCdvr	Code for Datum of Vertical Reference	4	BCS-A (DIGEST Part 3)	R
SDA	Sounding Datum Name	25	BCS-A (DIGEST Part 3)	R
VDCsda	Code for Sounding Datum	4	BCS-A (DIGEST Part 3)	R
DAG	Geodetic Datum Name	25	BCS-A (DIGEST Part 3)	R
DCD	Geodetic Datum Code	4	BCS-A (DIGEST Part 3)	R
HKE	Highest Known Elevation in Source	6	BCS-N (e.g. ± NNNNN)	R
UNHke	Units of HKE	3	BCS-A (DIGEST Part 3)	R
LON	Longitude/Easting of HKE	11	BCS-N ± ddd.dddddd / ± mmmmmmmmm.m	R
LAT	Latitude/Northing of HKE	11	BCS-N ± ddd.dddddd / ± mmmmmmmmm.m	R
NUM_MAG	Number of Sets of Magnetic Information	2	BCS-N 00-20	R
For each set of magnetic information...				
CDP	Type of Date	3	BCS-N (DIGEST Part 4)	R
CDV	Date of Magnetic Information	8	BCS-A (YYMMDD)	R
RAT	Annual Angular Magnetic Rate of Change (actual real value)	8	BCS-N	R
UNirat	Units for Magnetic Rate of Change	3	BCS-A (DIGEST Part 3)	R
GMA	Grid North—Magnetic North Angle (GMA)	8	BCS-N	R
UNigma	Units of GMA	3	BCS-A (DIGEST Part 3)	R
LON	Longitude/Easting Coordinate of GMA Reference Point	11	BCS-N (± ddd.dddddd / ± mmmmmmmmm.m)	R
LAT	Latitude/Northing Coordinate of GMA Reference Point	11	BCS-N (± ddd.dddddd / ± mmmmmmmmm.m)	R

TABLE D-1. SOURCE—Source extension—Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
GCA	Grid Convergence Angle (actual real value)	8	BCS-N	R
UNGea	Units of GCA	3	BCS-A (DIGEST Part 3)	R
...				
NUM_COO	Number of Coordinates in Bounding Polygon	2	BCS-N (04–99)	R
For each coordinate...				
LONn	Longitude/Easting of the G-M Angle Reference Point	11	BCS-N ± ddd.ddddd/ ± mmmmmmmmm.m	R
LATn	Latitude/Northing of the G-M Angle Reference Point	11	BCS-N ± ddd.ddddd/ ± mmmmmmmmm.m	R
...				
PRN	Projection Name	25	BCS-A (DIGEST Part 3)	R
PCO	Projection Code	2	BCS-A (DIGEST Part 3)	R
PAA	Proj. Param No. 1	10	BCS-N (DIGEST Part 3)	R
PAB	Proj. Param No. 2	10	BCS-N (DIGEST Part 3)	R
PAC	Proj. Param No. 3	10	BCS-N (DIGEST Part 3)	R
PAE	Proj. Param No. 4	10	BCS-N (DIGEST Part 3)	R
XOR	X (Easting) False Origin of Projection	10	BCS-N ± mmmmmmmmm.	R
YOR	Y (Northing) False Origin of Projection	10	BCS-N ± mmmmmmmmm.	R
QSS	Security Classification of Source	1	T | S | C | R | U	R
QOD	Originator's Permission Required for Downgrading (Y or N)	1	Y | N	R
CDV10	Downgrading Date Value	8	YYYYMMDD (Blank if QSS is "Y")	C
QLE	Releasability (If no release restrictions exists, "UNRESTRICTED" shall be entered in this entry.)	25	BCS-A	C
CPY	Copyright Statement (If none, "UNCOPYRIGHTED" shall be placed in this entry)	25	BCS-A	R
NUM_SETS	Number of insets	2	BCS-N	R
For each inset...				
INT	Unique ID for Inset	10	BCS-A	R
SCA	Reciprocal Scale of inset	9	BCS-N	R
NAM	Name of Inset	25	BCS-A	R

TABLE D-1. SOURCE—Source extension—Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
NTL	Absolute longitude of lower left corner of inset	11	BCS N ± ddd.ddddd/ ± mmmmmmmmm.m	R
TTL	Absolute latitude of lower left corner	11	“	R
NVL	Absolute longitude of upper left corner	11	“	R
TVL	Absolute latitude of upper left corner	11	“	R
NTR	Absolute longitude of upper right corner	11	“	R
TTR	Absolute latitude of upper right corner	11	“	R
NVR	Absolute longitude of lower right corner	11	“	R
TVR	Absolute latitude of lower right corner	11	“	R
NRL	Relative longitude of lower left corner	11	“	R
TRL	Relative latitude of lower left corner	11	“	R
NSL	Relative longitude of upper left corner	11	“	R
TSL	Relative latitude of upper left corner	11	“	R
NRR	Relative longitude of upper right corner	11	“	R
TRR	Relative latitude of upper right corner	11	“	R
NSR	Relative longitude of lower right corner	11	“	R
TSR	Relative latitude of lower right corner	11	“	R
...				
NUM_LEG S	Number of legends	2	BCS N	R
For each legend...				
NAM	Legend name	25	BCS A	R
BAD	Image file Identifier (Image ID)	2	BCS N 00—99	R
...				

APPENDIX E

SENSOR PARAMETERS DATA EXTENSION

E.1 SCOPE

~~———— The sensor parameters data extension (SNSPS) describes the parameters describing the capture of images by a sensor and its associated vector (aircraft, satellite...) ; these are also called auxiliary data. These parameters should allow a capture model of the sensor to accurately compute the location of any pixel of the image. ———~~

E.2 APPLICABLE DOCUMENTS

~~———— This section is not applicable to this appendix. ———~~

E.3 DEFINITIONS

~~———— The definitions in section 3 of this standard apply to this appendix. ———~~

E.4 GENERAL REQUIREMENTS

~~———— Hereafter are specified the general parameters defining the attributes of the image, sensor and vector (called basic parameters), that are most currently used ; in addition, a way to include specific parameters for one sensor/vector is proposed by adding a certain number of other auxiliary parameters, and, for each parameter, by giving its identification, its data format (integer, real or string, and its value. ———~~

E.5 DETAILED REQUIREMENTS

~~———— E.5.1 SNSPS — Sensor parameters extension. The user defined fields of the SNSPS extension are detailed in table E-1, and the descriptions of these fields are detailed in table TBD. ———~~

~~TABLE E-1. SNSPS — Sensor parameters extension.
(TYPE “R” = Required “C” = Conditional)~~

FIELD	NAME	SIZE	VALUE RANGE	TYP E
CETAG	Unique Extension Identifier.	5	BCS-A “SNSPS”	R
CEVER	Version.	1	BCS-A “A”	R
CEL	Length of Entire Tagged Record (Number of Bytes).	5	BCS-N	R
The following fields define SNSPS.				
NUM_BAND	Number of Bands of sensor image at capture	2	BCS-N	R
For each band				
BID	Original Scene Band Identification (original sensor image product)	5	BCS-A	R
WS1	Signal Lower Limit (in Nanometers for Wavelength)	5	BCS-N	R
WS2	Signal Upper Limit (in Nanometers for Wavelength)	5	BCS-N	R

TABLE E-1. SNSPS—Sensor parameters extension—Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
...				
REX	Resolution E-W Direction (unit UNires)	6	BCS-N	R
REY	Resolution N-S Direction (unit UNires)	6	BCS-N	C
GSX	Ground Sample Distance at Source E-W Direction (unit UNires)	6	BCS-N	C
GSY	Ground Sample Distance at Source N-S Direction (unit UNires)	6	BCS-N	C
UNires	Unit for resolution	3	BCS-A	R
Basic_Auxilliary_Parameters				
VEC	Vector or Mission Name	8	BCS-A	R
INS	Sensor or Instrument Name	8	BCS-A	R
MOD	Spectral Mode	4	BCS-A	R
PRL	Processing Level	5	BCS-A	R
CDV07	Acquisition Date	8	BCS-A (YYYYMMDD)	R
ACT	Acquisition Time (seconds)	14	BCS-A	R
ANG	Incidence Angle	7	BCS-N (+ / DDD.DD)	R
UNiang	Unit of Incidence Angle	3	BCS-A (DEG)	R
ALT	Altitude	9	BCS-N (+ / AAAA.AAA)	R
UNialt	Unit of Altitude	3	BCS-A	R

APPENDIX F

RASTER PRODUCT FORMAT (RPF) DATA EXTENSION

F.1 SCOPE

~~———— The RPF data extension (RPFDES) reflects the same information currently carried in the user defined fields of the National Imagery and Mapping Agency's RPF Products. These products include Compressed Arc Digitized Raster Graphics (CADRG), Controlled Image Base (CIB). The user defined fields provide supplemental information for geospatial registration. All of the RPF products are compliant with NITFS.~~

F.2 APPLICABLE DOCUMENTS

~~MIL STD 2411 ————— Raster Product Format~~

~~MIL STD 2411.1 ————— Registered Data Values for Raster Product Format~~

~~MIL STD 2411.2 ————— Integration of Raster Product Format Files into the National Imagery Transmission Format~~

~~NIMA TR 8350.2 ————— World Geodetic System 84, 2d Edition~~

~~NIMA TM 8358.1 ————— Datums, Ellipsoids, Grids, and Grid Reference System~~

~~Digital Geographic Information Exchange Standard (DIGEST), Edition 1.2~~

F.3 DEFINITIONS

~~———— Field names and values contained in the various tables of this document are not replicated in this list.~~

~~a. CADRG ————— Compression Arc Digital Raster Graphics~~

~~b. CIB ————— Controlled Image Base~~

F.4 GENERAL REQUIREMENTS

~~———— The extension defines ancillary or qualifying data about the overall frame image or areal subsets of the image. Pointers to attributes and one or more parameters for the attributes are enumerated for each areal extent in the offset records. These records provide offset locations to the actual values or codes corresponding to each attribute/parameter referenced. If the areal extent of the values for a given attribute is an entire frame, then the areal coverage sequence number is zero. Otherwise, the reference is to an explicit areal coverage record.~~

F.5 DETAILED REQUIREMENTS

~~———— F.5.1 The format for the user defined fields of the RPF extension (RPFDES) is detailed in table F 1. A list of available attributes and their parameters is shown in table F 2 and the fields in the RPFDES extension that define explicit areas are shown in table F 3. RPF uses binary data instead of ASCII, as was used in all the preceding data extensions. The format codes in the following tables are:~~

- ~~— I is a 4 byte integer~~
- ~~— S is a 2 byte integer~~
- ~~— F is a 4 byte floating point (real) value~~
- ~~— R is an 8 byte floating point (double precision) value~~
- ~~— T is a 1 byte text element~~
- ~~— T,n is a text string "n" bytes long~~

TABLE F-1. RPFDES data extension.

FIELD	NAME	FORMAT	VALUE RANGE	UNITS	TYPE
CETAG	Unique Extension Identifier	T,5	RPFDES	N/A	R
CEVER	Version	T	A	N/A	R
CEL	Length of Entire Tagged Record	T,5	TBD	Bytes	R
NUM_SETS	No. of Attribute Offset Records	S	1 or more	N/A	R
NUM_AREA	No. of Areas	S	1 or more	N/A	R
ATT_OTO	Att. Offset Table Offset	I	actual	bytes	R
ATT_ORL	Att. Offset Record Length	S	actual	bytes	R

For each attribute offset record...

ATT_ID	Attribute ID	S	1 to NUM_SETS	N/A	R
PARAM_ID	Parameter ID	T	1 to 5	N/A	R
SEQ_NO	Sequence No.	T	1 to NUM_AREAS	N/A	R
ATT_ROS	Attribute Record Offset	I	NUM_SETS*8 to Attribute Subsection Length	bytes	R

F.5.2 For each Attribute (by ID number "ATT_ID")...

Find the attribute and parameter value (at the offset byte location) and read the value using the format needed for that attribute/parameter combination. The format for each attribute/parameter combination is given in table F-2.

TABLE F-2. RPF attributes and their parameters that can be called by the attribute extension.

ATT_ID	DEFINITION	PARAM_ID	DEFINITION	FORMAT
1	Currency Date	1	Currency Date	T,8
2	Production Date	1	Production Date	T,8
3	Significant Date	1	Significant Date	T,8
4	Map/Chart Source	1	Series Designation	T,10
4	Map/Chart Source	2	Map Designation	T,8
4	Map/Chart Source	3	Old Horizontal Datum	T,4
4	Map/Chart Source	4	Edition ID	T,7
5	Projection System	1	Projection Code	T,2
5	Projection System	2	Parameter A	F
5	Projection System	3	Parameter B	F
5	Projection System	4	Parameter C	F
5	Projection System	5	Parameter D	F
6	Vertical Datum	1	Vertical Datum Code	T,4
7	Horizontal Datum	1	Horizontal Datum Code	T,4
8	Vertical Absolute Accuracy	1	Vertical Absolute Accuracy	I
8	Units for Vertical Accuracy	2	Units of Measure	S

TABLE F 2. RPF attributes and their parameters that can be called by the attribute extension — Continued.

ATT_ID	DEFINITION	PARAM_ID	DEFINITION	FORMA T
9	Horizontal Absolute Accuracy	1	Horizontal Absolute Accuracy	I
9	Units for Horizontal Accuracy	2	Units of Measure	S
10	Vertical Relative Accuracy	1	Vertical Relative Accuracy	I
10	Units for Vertical Accuracy	2	Units of Measure	S
11	Horizontal Relative Accuracy	1	Horizontal Relative Accuracy	I
11	Units for Horizontal Accuracy	2	Units of Measure	S
12	Ellipsoid	1	Ellipsoid Code	T,3
13	Sounding Datum	1	Sounding Datum Code	T,4
14	Navigation System	1	Navigation System Code	I
15	Grid	1	Grid code used for the RPF frame	T,2
16	Easterly Annual Magnetic Change	1	Easterly Annual Magnetic Change	F
16	Units of Magnetic Change	2	Units of Magnetic Change	S
17	Westerly Annual Magnetic Change	1	Westerly Annual Magnetic Change	F
17	Units of Magnetic Change	2	Units of Magnetic Change	S
18	Grid North Magnetic North (G-M) Angle	1	Grid North Magnetic North (G-M) Angle	F
18	Units of Angle	2	Units of Angle	S
19	Grid Convergence Angle	1	Grid Convergence Angle	F
19	Units of Angle	2	Units of Angle	S
20	Maximum Elevation	1	Highest Known Elevation	R
20	Units of Elevation	2	Units of Elevation	S
20	Latitude of Elevation	3	Latitude of Highest Point	R
20	Longitude of Elevation	4	Longitude of Highest Point	R
21	Multiple Legend	1	Legend File Name	T,12

TABLE F 3. Explicit areal extent part of RPFDES data extension.

For each explicit areal extent...

FIELD	NAME	FORMA T	VALUE RANGE	UNITS	TYPE
EACTO	Explicit Areal Coverage Table Offset	I	8	Bytes	R
EACRL	Explicit Areal Coverage Record Length	S	82 (when 5 vertices are used)	Bytes	R
CCRL	Corner Coordinate Record Length	S	16	Bytes	R

For each area coverage record...

NUM_VE R	Number of Vertices	S	At least 3 but usually 5	N/A	R
-------------	--------------------	---	--------------------------	-----	---

For each vertex...

LAT	Latitude	R	-90 to 90	Degrees	R
LON	Longitude	R	-180 to 180	Degrees	R